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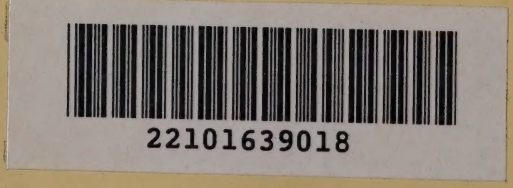

International Health Exhibition,
LONDON, 1884.

THE

HEALTH EXHIBITION LITERATURE.

VOLUME XIX.

RETURN OF NUMBER OF VISITORS AND STATISTICAL TABLES.

OFFICIAL GUIDE.

GUIDE TO THE SANITARY AND INSANITARY HOUSES.

HANDBOOK TO THE AQUARIUM AND FISH CULTURE DEPARTMENT.

ANTHROPOMETRIC LABORATORY.

PUBLIC HEALTH IN CHINA.

NATIONAL EDUCATION IN CHINA.

DIET, DRESS, AND DWELLINGS OF THE CHINESE IN RELATION TO HEALTH.

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RETURN SHOWING

THE

AMOUNT OF RECEIPTS TAKEN AT THE GATES

AND THE

NUMBER OF VISITORS,

UNDER THE VARIOUS HEADS, ON EACH DAY THAT THE EXHIBITION WAS OPEN TO THE PUBLIC.

Date.	Day of the Week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. d.	£ s. d.							
May 8	Thursday ..	2 6	212 15 0	1,702	..	1	63	4,443	6,209	..
,, 9	Friday.. ..	1 0	217 4 6	4,306	77	1,200	426	2,382	8,391	..
,, 10	Saturday ..	1 0	424 8 0	8,426	118	2,826	659	2,597	14,626	..
	Totals		854 7 6	14,434	195	4,027	1,148	9,422	..	29,226
,, 12	Monday ..	1 0	235 12 0	4,684	56	1,527	350	1,873	8,490	..
,, 13	Tuesday ..	1 0	286 19 0	5,665	146	2,031	530	2,157	10,529	..
,, 14	Wednesday..	2 6	367 2 6	2,937	..	607	132	2,459	6,135	..
,, 15	Thursday ..	1 0	296 8 6	5,886	81	2,235	518	1,765	10,485	..
,, 16	Friday.. .	1 0	301 17 6	5,989	99	1,746	490	2,049	10,373	..
,, 17	Saturday ..	1 0	604 0 6	11,980	176	4,875	832	2,901	20,764	..
	Totals for week		2,092 0 0	37,141	558	13,021	2,852	13,204	..	66,776
	„ first 3 days		854 7 6	14,434	195	4,027	1,148	9,422	..	..
	„ since opening		2,946 7 6	51,575	753	17,048	4,000	22,626	..	96,002
,, 19	Monday ..	1 0	278 16 0	5,524	86	2,091	421	2,048	10,170	..
,, 20	Tuesday ..	1 0	335 10 0	6,637	144	2,516	649	2,022	11,968	..
,, 21	Wednesday..	2 6	614 11 0	4,915	..	788	224	3,418	9,345	..
,, 22	Thursday ..	1 0	385 6 6	7,627	150	3,099	675	2,028	13,579	..
,, 23	Friday.. ..	1 0	357 2 0	7,063	158	2,321	497	2,224	12,263	..
,, 24	Saturday ..	1 0	740 11 0	14,689	244	6,737	1,170	3,055	25,895	..
	Totals for week		2,711 16 6	46,455	782	17,552	3,636	14,795	..	83,220
	„ to last week		2,946 7 6	51,575	753	17,048	4,000	22,626	..	..
	„ since opening		5,658 4 0	98,030	1,535	34,600	7,636	37,421	..	179,222

Date.	Day of the Week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. d.	£ s. d.							
May 26	Monday ..	1 0	379 4 0	7,523	122	2,907	556	2,498	13,606	..
,, 27	Tuesday ..	1 0	473 10 6	9,355	231	3,643	710	2,809	16,748	..
,, 28	Wednesday ..	2 6	658 15 0	5,270	..	1,107	274	3,429	10,080	..
,, 29	Thursday ..	1 0	407 1 6	8,058	167	3,679	589	1,998	14,491	..
,, 30	Friday	1 0	417 11 6	8,229	245	3,311	546	2,290	14,621	..
,, 31	Saturday ..	1 0	617 7 0	12,224	246	6,666	992	2,793	22,921	..
	Totals for week ..		2,953 9 6	50,659	1,011	21,313	3,667	15,817	..	92,467
	„ to last week		5,658 4 0	98,030	1,535	34,600	7,636	37,421	..	179,222
	Totals since opening		8,611 13 6	148,689	2,546	55,913	11,303	53,238	..	271,689
June 2	Monday ..	1 0	1,414 15 0	28,145	187	20,189	2,955	3,203	54,679	..
,, 3	Tuesday ..	1 0	789 1 6	15,689	169	12,483	1,460	2,241	32,042	..
,, 4	Wednesday ..	2 6	576 10 0	4,611	..	1,303	266	2,828	9,008	..
,, 5	Thursday ..	1 0	407 15 6	8,089	129	5,599	901	1,695	16,413	..
,, 6	Friday ..	1 0	349 7 6	6,931	107	3,951	623	1,846	13,458	..
,, 7	Saturday ..	1 0	736 19 6	14,565	333	9,357	1,120	3,174	28,549	..
	Totals for week ..		4,274 9 0	78,030	925	52,882	7,325	14,987	..	154,149
	„ to last week		8,611 13 6	148,689	2,546	55,913	11,303	53,238	..	..
	Totals since opening		12,886 2 6	226,719	3,471	108,795	18,628	68,225	..	425,838
,, 9	Monday ..	1 0	404 13 0	7,994	190	5,127	602	2,398	16,311	..
,, 10	Tuesday ..	1 0	566 17 6	11,190	283	6,540	731	2,884	21,628	..
,, 11	Wednesday ..	2 6	1,079 12 6	8,637	..	2,163	611	4,867	16,278	..
,, 12	Thursday ..	1 0	688 4 6	13,610	303	7,726	933	2,862	25,434	..
,, 13	Friday	1 0	580 1 6	11,466	263	5,081	1,548	2,876	21,234	..
,, 14	Saturday ..	1 0	1,088 8 6	21,563	397	14,673	1,466	4,137	42,236	..
	Totals for week ..		4,407 17 6	74,460	1,436	41,310	5,891	20,024	..	143,121
	„ to last week		12,886 2 6	226,719	3,471	108,795	18,628	68,225	..	..
	Totals since opening		17,294 0 0	301,179	4,907	150,105	24,519	88,249	..	568,959

Date.	Day of the Week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. d.	£ s. d.							
June 16	Monday ..	1 0	527 14 0	10,457	200	6,709	837	2,640	20,843	..
,, 17	Tuesday ..	1 0	550 6 6	10,915	183	7,177	871	2,533	21,679	..
,, 18	Wednesday ..	2 6	1,212 5 0	9,698	..	2,561	469	5,148	17,876	..
,, 19	Thursday ..	1 0	612 7 0	12,135	220	7,889	894	2,849	23,987	..
,, 20	Friday	1 0	498 15 0	9,883	180	5,203	599	2,702	18,567	..
,, 21	Saturday ..	1 0	1,015 1 0	20,129	338	14,421	1,419	3,863	40,170	..
	Totals for week		4,416 8 6	73,217	1,121	43,960	5,089	19,735	..	143,122
	„ to last week		17,294 0 0	301,179	4,907	150,105	24,519	88,249	..	568,959
	Totals since opening		21,710 8 6	374,396	6,028	194,065	29,608	107,984	..	712,081
,, 23	Monday ..	1 0	598 9 0	11,870	190	7,391	925	2,882	23,258	..
,, 24	Tuesday ..	1 0	666 2 6	13,188	269	8,201	1,258	3,195	26,111	..
,, 25	Wednesday ..	2 6	1,446 7 6	11,563	..	2,500	568	6,036	20,667	..
,, 26	Thursday ..	1 0	679 11 6	13,475	225	8,623	937	2,737	25,997	..
,, 27	Friday	1 0	554 10 0	10,983	208	5,171	727	2,841	19,930	..
,, 28	Saturday ..	1 0	1,085 9 0	21,547	306	16,053	1,768	3,495	43,169	..
	Totals for week ..		5,030 9 6	82,626	1,198	47,939	6,183	21,186	..	159,132
	„ to last week		21,710 8 6	374,396	6,028	194,065	29,608	107,984	..	..
	Totals since opening		26,740 18 0	457,022	7,226	242,004	35,791	129,170	..	871,213
,, 30	Monday ..	1 0	588 13 6	11,678	191	7,496	915	2,881	23,161	..
July 1	Tuesday ..	1 0	658 9 0	13,043	252	7,624	949	4,090	25,958	..
,, 2	Wednesday ..	2 6	1,497 7 6	11,977	..	2,438	584	5,185	20,184	..
,, 3	Thursday ..	1 0	650 5 6	12,893	211	7,833	1,233	2,657	24,827	..
,, 4	Friday	1 0	539 16 6	10,698	185	5,149	796	2,856	19,684	..
,, 5	Saturday ..	1 0	921 17 0	18,302	254	14,182	1,519	3,417	37,674	..
	Totals for week ..		4,856 9 0	78,591	1,093	44,722	5,996	21,086	..	151,488
	„ to last week		26,740 18 0	457,022	7,226	242,004	35,791	129,170	..	..
	Totals since opening		31,597 7 0	535,613	8,319	286,726	41,787	150,256	..	1,022,701

Date.	Day of the Week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. d.	£ s. d.							
July 7	Monday ..	1 0	678 4 6	13,463	189	8,459	1,168	2,929	26,208	..
,, 8	Tuesday ..	1 0	803 1 0	15,913	274	9,364	1,304	3,121	29,976	..
,, 9	Wednesday..	2 6	285 0 0	2,280	..	685	94	1,289	4,348	..
,, 10	Thursday ..	1 0	573 11 0	11,393	142	7,760	1,053	2,617	22,965	..
,, 11	Friday.. ..	1 0	539 5 6	10,671	219	5,836	1,050	2,647	20,423	..
,, 12	Saturday ..	1 0	830 19 0	16,467	294	14,690	1,447	3,678	36,576	..
	Totals for week ..		3,710 1 0	70,187	1,118	46,794	6,116	16,281	..	140,496
	„ to last week		31,597 7 0	535,613	8,319	286,726	41,787	150,256	..	1,022,701
	Totals since opening		35,307 8 0	605,800	9,437	333,520	47,903	166,537	..	1,163,197
,, 14	Monday ..	1 0	589 11 0	11,706	170	8,487	840	2,930	24,133	..
,, 15	Tuesday ..	1 0	583 11 6	11,575	183	8,525	1,460	2,746	24,489	..
,, 16	Wednesday..	2 6	1,390 0 0	11,118	..	2,721	566	5,558	19,963	..
,, 17	Thursday ..	1 0	644 13 6	12,785	197	9,662	1,328	3,387	27,359	..
,, 18	Friday.. ..	1 0	512 10 0	10,171	154	6,178	760	2,879	20,142	..
,, 19	Saturday ..	1 0	1,038 4 0	20,590	298	18,403	14,635	3,743	57,669	..
	Totals for week ..		4,758 10 0	77,945	1,002	53,976	19,589	21,243	..	173,755
	„ to last week		35,307 8 0	605,800	9,437	333,520	47,903	166,537	..	..
	Totals since opening		40,065 18 0	683,745	10,439	387,496	67,492	187,780	..	1,336,952
,, 21	Monday ..	1 0	503 15 0	10,007	136	8,006	1,136	2,322	21,607	..
,, 22	Tuesday ..	1 0	669 7 0	13,361	236	10,154	1,316	3,282	28,249	..
,, 23	Wednesday..	2 6	207 2 6	1,657	..	418	107	1,492	3,674	..
,, 24	Thursday ..	1 0	725 15 0	14,400	204	11,331	1,500	3,125	30,560	..
,, 25	Friday.. ..	1 0	536 9 6	10,653	153	7,253	1,097	4,228	23,384	..
,, 26	Saturday ..	1 0	700 13 6	13,866	283	15,564	1,477	2,698	33,888	..
	Totals for week ..		3,343 2 6	63,844	1,012	52,726	6,633	17,147	..	141,362
	„ to last week		40,065 18 0	683,745	10,439	387,496	67,492	187,780	..	..
	Totals since opening		43,409 0 6	747,589	11,451	440,222	74,125	204,927	..	1,478,314

Date.	Day of the Week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. *d.*	£ *s.* *d.*							
July 28	Monday ..	1 0	550 18 6	10,959	109	9,709	972	2,147	23,896	..
,, 29	Tuesday ..	1 0	607 17 0	12,061	192	10,292	1,181	2,377	26,103	..
,, 30	Wednesday ..	2 6	1,227 10 0	9,820	..	3,061	734	5,364	18,979	..
,, 31	Thursday ..	1 0	742 0 6	14,746	189	12,102	1,524	2,687	31,248	..
Aug. 1	Friday	1 0	568 0 0	11,255	210	7,741	922	2,986	23,114	..
,, 2	Saturday ..	1 0	905 14 6	17,986	237	14,536	1,961	3,793	38,513	..
	Totals for week ..		4,602 0 6	76,827	937	57,441	7,294	19,354	..	161,853
	„ to last week		43,409 0 6	747,589	11,451	440,222	74,125	204,927	..	1,478,314
	Totals since opening		48,011 1 0	824,416	12,388	497,663	81,419	224,281	..	1,640,167
,, 4	Monday ..	1 0	1,514 5 6	30,091	165	36,189	2,794	2,645	71,884	..
,, 5	Tuesday ..	1 0	901 9 6	17,932	167	21,729	1,743	2,349	43,920	..
,, 6	Wednesday ..	2 6	1,187 5 0	9,496	..	3,530	701	5,399	19,126	..
,, 7	Thursday ..	1 0	724 6 0	14,375	206	14,555	1,735	2,772	33,643	..
,, 8	Friday	1 0	502 5 0	9,986	118	8,432	856	2,726	22,118	..
,, 9	Saturday ..	1 0	693 14 0	13,788	172	14,473	1,253	2,801	32,487	..
	Totals for week ..		5,523 5 0	95,668	828	98,908	9,082	18,692	..	223,178
	„ to last week		48,011 1 0	824,416	12,388	497,663	81,419	224,281	..	..
	Totals since opening		53,534 6 0	920,084	13,216	596,571	90,501	242,973	..	1,863,345
, 11	Monday ..	1 0	502 9 6	9,986	123	10,344	929	1,905	23,287	..
,, 12	Tuesday ..	1 0	532 17 6	10,593	129	10,850	1,488	1,945	25,005	..
,, 13	Wednesday ..	2 6	938 0 0	7,501	..	2,792	747	3,839	14,879	..
,, 14	Thursday ..	1 0	592 15 0	11,771	156	12,971	1,348	1,872	28,118	..
,, 15	Friday	1 0	430 19 6	8,575	89	7,867	1,005	1,801	19,337	..
,, 16	Saturday ..	1 0	779 16 6	15,505	175	18,264	1,570	2,416	37,930	..
	Totals for week ..		3,776 18 0	63,931	672	63,088	7,087	13,778	..	148,556
	„ to last week		53,534 6 0	920,084	13,216	596,571	90,501	242,973	..	..
	Totals since opening		57,311 4 0	984,015	13,888	659,659	97,588	256,751	..	2,011,901

Date.	Day of the Week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. d.	£ s. d.							
Aug. 18	Monday ..	1 0	604 8 0	12,020	126	14,578	1,617	1,797	30,138	..
,, 19	Tuesday ..	1 0	547 11 6	10,892	119	14,182	1,318	1,534	28,045	..
,, 20	Wednesday ..	2 6	895 15 0	7,161	..	3,532	763	4,030	15,486	..
,, 21	Thursday ..	1 0	608 8 0	12,102	128	14,930	1,477	1,921	30,558	..
,, 22	Friday	1 0	422 5 0	8,375	140	8,609	844	1,739	19,707	..
,, 23	Saturday ..	1 0	866 6 0	17,230	192	22,624	2,352	2,538	44,936	..
	Totals for week ..		3,944 13 6	67,780	705	78,455	8,371	13,559	..	168,870
	„ to last week		57,311 4 0	984,015	13,888	659,659	97,588	256,751	..	2,011,901
	Totals since opening		61,255 17 6	1,051,795	14,593	738,114	105,959	270,310	..	2,180,771
,, 25	Monday ..	1 0	507 12 6	10,096	113	15,467	1,474	1,744	28,894	..
,, 26	Tuesday ..	1 0	613 18 0	12,215	120	15,971	1,762	1,811	31,879	..
,, 27	Wednesday ..	2 6	593 0 0	4,744	..	2,971	648	2,799	11,162	..
,, 28	Thursday ..	1 0	445 13 6	8,856	107	13,143	1,366	1,560	25,032	..
,, 29	Friday	1 0	360 13 0	7,175	76	8,222	772	1,767	18,012	..
,, 30	Saturday ..	1 0	643 5 0	12,787	142	21,447	1,644	2,014	38,034	..
	Totals for week ..		3,164 2 0	55,873	558	77,221	7,666	11,695	..	153,013
	„ to last week		61,255 17 6	1,051,795	14,593	738,114	105,959	270,310	..	..
	Totals since opening		64,419 19 6	1,107,668	15,151	815,335	113,625	282,005	..	2,333,784
Sept. 1	Monday ..	1 0	522 19 0	10,418	82	17,739	1,660	1,385	31,284	..
,, 2	Tuesday ..	1 0	514 17 6	10,250	85	15,421	1,339	1,719	28,814	..
,, 3	Wednesday ..	2 6	778 10 0	6,228	..	3,876	688	3,668	14,460	..
,, 4	Thursday ..	1 0	306 14 6	6,103	69	9,451	1,285	1,392	18,300	..
,, 5	Friday	1 0	459 1 6	9,120	117	11,594	1,182	1,855	23,868	..
,, 6	Saturday ..	1 0	593 8 6	11,811	99	20,925	1,866	2,216	36,917	..
	Totals for week ..		3,175 11 0	53,930	452	79,006	8,020	12,235	..	153,643
	„ to last week		64,419 19 6	1,107,668	15,151	815,335	113,625	282,005	..	..
	Totals since opening		67,595 10 6	1,161,598	15,603	894,341	121,645	294,240	..	2,487,427

Date.	Day of the Week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. d.	£ s. d.							
Sept. 8	Monday ..	1 0	620 11 0	12,336	138	24,314	1,268	2,875	40,931	..
,, 9	Tuesday ..	1 0	524 5 6	10,431	105	15,224	1,697	1,925	29,382	..
,, 10	Wednesday ..	2 6	886 12 6	7,093	..	4,450	855	4,131	16,529	..
,, 11	Thursday ..	1 0	564 1 6	11,217	129	16,598	1,555	2,003	31,502	..
,, 12	Friday	1 0	399 10 6	7,947	87	9,703	974	1,932	20,643	..
,, 13	Saturday ..	1 0	960 9 0	19,103	186	31,796	2,443	2,821	56,349	..
	Totals for week ..		3,955 10 0	68,127	645	102,085	8,792	15,687	..	195,336
	„ to last week		67,595 10 6	1,161,598	15,603	894,341	121,645	294,240	..	2,487,427
	Totals since opening		71,551 0 6	1,229,725	16,248	996,426	130,437	309,927	..	2,682,763
,, 15	Monday ..	1 0	999 15 6	19,873	213	30,192	3,194	2,499	55,971	..
,, 16	Tuesday ..	1 0	595 19 0	11,862	98	15,819	1,636	1,831	31,246	..
,, 17	Wednesday ..	2 6	1,121 5 0	8,966	..	4,888	1,256	4,602	19,712	..
,, 18	Thursday ..	1 0	669 13 0	13,315	138	18,551	1,906	2,201	36,111	..
,, 19	Friday	1 0	407 4 6	8,093	87	9,632	1,012	1,884	20,708	..
,, 20	Saturday ..	1 0	835 19 0	16,649	136	28,864	2,600	2,620	50,869	..
	Totals for week ..		4,629 16 0	78,758	672	107,946	11,604	15,637	..	214,617
	„ to last week		71,551 0 6	1,229,725	16,248	996,426	130,437	309,927	..	..
	Totals since opening		76,180 16 6	1,308,483	16,920	1,104,372	142,041	325,564	..	2,897,380
,, 22	Monday ..	1 0	731 7 6	14,557	123	24,884	2,445	2,126	44,135	..
,, 23	Tuesday ..	1 0	509 1 6	10,131	93	14,636	1,408	2,023	28,291	..
,, 24	Wednesday ..	2 6	834 5 0	6,672	..	4,365	1,003	3,826	15,866	..
,, 25	Thursday ..	1 0	629 10 6	12,526	125	19,153	2,017	2,295	36,116	..
,, 26	Friday	1 0	381 17 0	7,597	74	10,061	947	1,972	20,651	..
,, 27	Saturday ..	1 0	572 4 0	11,383	118	24,337	1,741	2,565	40,144	..
	Totals for week ..		3,658 5 6	62,866	533	97,436	9,561	14,807	..	185,203
	„ to last week		76,180 16 6	1,308,483	16,920	1,104,372	142,041	325,564	..	..
	Totals since opening		79,839 2 0	1,371,349	17,453	1,201,808	151,602	340,371	..	3,082,583

Date.	Day of the week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
		s. d.	£ s. d.							
Sept. 29	Monday ..	1 0	668 8 0	13,318	88	29,359	1,973	1,965	46,703	..
,, 30	Tuesday ..	1 0	527 9 6	10,505	75	23,034	1,345	1,804	36,763	..
Oct. 1	Wednesday ..	2 6	852 17 6	6,819	..	4,046	844	4,071	15,780	..
,, 2	Thursday ..	1 0	545 12 6	10,827	129	25,406	1,640	2,082	40,084	..
,, 3	Friday	1 0	407 17 6	8,092	111	11,984	1,028	2,311	23,526	..
,, 4	Saturday ..	1 0	844 3 0	16,787	122	35,120	2,895	3,171	58,095	..
	Totals for week ..		3,846 8 0	66,348	525	128,949	9,725	15,404	..	220,951
	„ to last week		79,839 2 0	1,371,349	17,453	1,201,808	151,602	340,371	..	3,082,583
	Totals since opening		83,685 10 0	1,437,697	17,978	1,330,757	161,327	355,775	..	3,303,534
,, 6	Monday ..	1 0	541 9 6	10,742	107	28,018	1,608	1,966	42,441	..
,, 7	Tuesday ..	1 0	550 6 6	10,939	101	18,870	1,699	2,088	33,697	..
,, 8	Wednesday ..	2 6	1,010 2 6	8,078	..	5,168	1,068	3,033	17,347	..
,, 9	Thursday ..	1 0	519 10 6	10,325	79	24,519	1,741	1,747	38,411	..
,, 10	Friday	1 0	286 5 6	5,698	35	11,872	791	1,497	19,893	..
,, 11	Saturday ..	1 0	740 8 0	14,712	120	26,924	4,492	2,897	49,145	..
	Totals for week ..		3,648 2 6	60,494	442	115,371	11,399	13,228	..	200,934
	„ to last week		83,685 10 0	1,437,697	17,978	1,330,757	161,327	355,775	..	..
	Totals since opening		87,333 12 6	1,498,191	18,420	1,446,128	172,726	369,003	..	3,504,468
,, 13	Monday ..	1 0	704 9 0	14,038	102	27,062	1,899	2,257	45,358	..
,, 14	Tuesday ..	1 0	564 15 6	11,223	121	21,189	1,501	2,023	36,057	..
,, 15	Wednesday ..	2 6	955 15 0	7,646	..	4,405	1,155	4,163	17,369	..
,, 16	Thursday ..	1 0	677 11 6	13,458	143	26,325	2,385	2,673	44,984	..
,, 17	Friday	1 0	411 6 0	8,170	108	12,288	1,390	2,283	24,239	..
,, 18	Saturday ..	1 0	745 13 0	14,831	144	30,583	2,331	3,063	50,952	..
	Totals for week ..		4,059 10 0	69,366	618	121,852	10,661	16,462	..	218,959
	„ to last week		87,333 12 6	1,498,191	18,420	1,446,128	172,726	369,003	..	..
	Totals since opening		91,393 2 6	1,567,557	19,038	1,567,980	183,387	385,465	..	3,723,427

Date.	Day of the week.	Entrance Fee.	Cash Received at the Doors.	Number of Visitors during the Hours the Exhibition was open to the Public.						
				Paying at the Doors.	Half-price. R.H.S. Fellows.	With Railway Tickets.	With Paper Tickets.	With Season Tickets.	Total each day.	Total to end of week.
			£ s. d.							
Oct. 20	Monday ..	1 0	825 14 6	16,432	111	33,339	2,362	2,448	54,692	..
,, 21	Tuesday ..	1 0	654 16 0	13,013	116	24,347	2,204	2,234	41,914	..
,, 22	Wednesday ..	2 6	1,321 10 0	10,572	..	5,961	1,913	5,836	24,282	..
,, 23	Thursday ..	1 0	798 7 6	15,867	157	27,505	3,059	2,813	49,401	..
,, 24	Friday	1 0	583 16 6	11,584	135	21,220	2,110	5,323	40,372	..
,, 25	Saturday ..	1 0	686 18 0	13,623	202	28,984	3,882	3,223	49,914	..
	Totals for week ..		4,871 2 6	81,091	721	141,356	15,530	21,877	..	260,575
	„ to last week		91,393 2 6	1,567,557	19,038	1,567,980	183,387	385,465	..	3,723,427
	Totals since opening		96,264 5 0	1,648,648	19,759	1,709,336	198,917	407,342	..	3,984,002
,, 27	Monday ..	1 0	871 7 0	17,292	202	30,885	3,932	2,791	55,102	..
,, 28	Tuesday ..	1 0	817 15 6	16,180	319	30,519	4,406	3,033	54,457	..
,, 29	Wednesday ..	2 6	1,110 17 6	8,887	..	5,807	2,262	5,705	22,661	..
,, 30	Thursday ..	1 0	526 17 6	10,353	267	18,611	3,734	4,203	37,168	..
	Totals for 4 days ..		3,326 17 6	52,712	788	85,822	14,334	15,732	..	169,388
	„ to last week		96,264 5 0	1,648,648	19,759	1,709,336	198,917	407,342	..	..
	Totals since opening		99,591 2 6	1,701,360	20,547	1,795,158	213,251	423,074	..	4,153,390
	Averages		659 10 10	11,267	136	11,888	1,412	2,802	27,505	..
July 24	Wednesday	20*s.* & 10*s.*	242 10 0	273	Hospital Fête. ..		14,020			14,293

Cash Received at the Doors.—A difference will, in many cases, be found to exist between the amount of cash shown under this heading and the numbers given as payments at the doors and half-price admissions, which is explained by the fact that the amounts given are the amounts actually paid into the bank. On days when the number has been very great, it has often happened that the amount of cash actually taken has been in excess of that registered.

Season Tickets.—Besides the ordinary Season Tickets, Royal Horticultural Society Tickets, Royal Albert Hall Tickets and Passes, Exhibitors and Assistants' Passes, and Complimentary Season Tickets are included in these numbers.

J. Douglas Dick,

Superintendent of Entrances.

STATISTICAL TABLES.

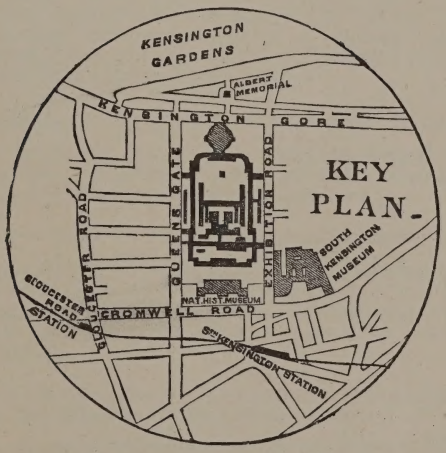
RETURN SHOWING SALE OF OFFICIAL PUBLICATIONS DURING THE TERM OF THE EXHIBITION.

Date.	Number of Visitors.	Catalogues.	Guides.	Musical Programmes.	Cookery.	Handbooks.	Lectures and Conferences.	Historical Costumes.
May 8 ..	6,105	1,238	1,020	2,845	118	..	..	..
,, 9 ..	8,368	630	1,065	1,033	57	..	..	..
,, 10 ..	14,559	629	1,347	2,470	78	..	..	..
,, 12 ..	8,490	362	877	1,190	42	..	..	..
,, 13 ..	10,723	390	881	1,329	63	3	..	..
,, 14 ..	6,135	331	578	858	83	4	..	..
,, 15 ..	10,485	369	912	1,097	138	2	..	..
,, 16 ..	10,373	328	886	1,114	141	3	..	..
,, 17 ..	20,764	409	1,169	2,853	150	2	..	..
,, 19 ..	10,170	277	784	1,092	120	3	..	..
,, 20 ..	11,968	318	952	1,258	172	5	..	..
,, 21 ..	9,345	371	685	1,153	111	4	..	..
,, 22 ..	13,579	341	1,044	1,386	133	4	..	..
,, 23 ..	12,263	301	807	1,409	131	2	..	..
,, 24 ..	25,895	395	1,380	3,469	167	4	..	..
,, 26 ..	13,606	297	887	2,003	105	2	..	..
,, 27 ..	16,748	384	1,077	2,233	164	4	..	..
,, 28 ..	10,080	322	679	1,414	110	4	..	..
,, 29 ..	14,491	309	890	1,682	122	4	..	..
,, 30 ..	14,621	299	907	1,687	140	4	..	..
,, 31 ..	22,921	329	1,154	3,202	141	4	..	..
June 2 ..	54,679	462	2,553	5,323	219	7	..	..
,, 3 ..	32,042	441	2,109	3,397	239	13	..	..
,, 4 ..	9,008	309	805	1,219	112	6	..	..
,, 5 ..	16,413	378	1,266	1,750	198	5	..	..
,, 6 ..	13,458	376	1,017	1,457	185	9	..	..
,, 7 ..	28,549	334	1,239	3,865	144	19	..	..
,, 9 ..	16,311	346	1,034	2,234	162	10	..	..
,, 10 ..	21,628	324	1,160	2,783	167	14	..	..
,, 11 ..	16,278	342	837	1,892	120	11	..	..
,, 12 ..	25,434	350	1,205	3,119	170	11	..	..
,, 13 ..	21,234	254	1,024	2,877	135	10	..	..
,, 14 ..	42,236	321	1,507	5,529	131	14	..	..
,, 16 ..	20,843	287	1,170	2,674	152	13	..	..
,, 17 ..	21,679	305	1,173	2,952	142	14	..	..
,, 18 ..	17,876	286	982	2,357	109	14	..	..
,, 19 ..	23,987	360	1,012	2,996	143	16	..	..
,, 20 ..	18,567	294	989	2,405	143	16	..	..
,, 21 ..	40,170	315	1,423	5,805	142	16	..	..
,, 23 ..	23,258	276	1,128	3,137	124	15	..	..
,, 24 ..	26,111	312	1,198	3,073	144	18	..	..
,, 25 ..	20,667	291	855	2,853	107	15	..	..
,, 26 ..	25,997	314	1,120	3,136	138	37	..	..
,, 27 ..	19,930	249	906	2,554	134	26	..	..
,, 28 ..	43,169	266	1,453	5,708	132	15	..	..
,, 30 ..	23,161	224	1,011	2,711	114	17	..	..
July 1 ..	25,958	234	1,050	2,874	117	21	..	..
,, 2 ..	20,184	246	832	3,087	80	24	..	..
,, 3 ..	24,827	247	1,045	3,028	118	23	..	..
,, 4 ..	19,684	173	748	2,564	99	20	..	..
,, 5 ..	37,674	200	1,205	6,039	107	17	..	..
,, 7 ..	26,208	218	1,194	4,004	126	16	..	..
Carried forward	1,048,909	17,963	56,231	136,179	6,839	540	..	..

Date.	Number of Visitors.	Catalogues.	Guides.	Musical Programmes.	Cookery.	Handbooks.	Lectures and Conferences.	Historical Costumes.
Brot. forward	1,048,909	17,963	56,231	136,179	6,839	540	..	..
July 8 ..	29,976	268	1,174	3,855	142	15	..	..
,, 9 ..	4,348	151	563	559	75	16	..	..
,, 10 ..	22,965	222	1,078	2,855	107	15	..	..
,, 11 ..	20,423	196	1,063	2,718	150	31	..	..
,, 12 ..	36,576	230	1,425	5,764	124	20	..	..
,, 14 ..	24,133	188	1,069	3,229	119	28	..	..
,, 15 ..	24,489	198	1,151	3,221	139	21	..	..
,, 16 ..	19,963	211	861	3,232	95	24	..	..
,, 17 ..	27,359	200	1,239	2,979	128	23	..	..
,, 18 ..	20,142	164	1,044	2,728	121	24	1	..
,, 19 ..	57,669	193	1,726	6,713	112	16	..	..
,, 21 ..	21,607	133	1,095	2,607	106	24	..	..
,, 22 ..	28,249	219	1,454	3,240	152	18	1	..
,, 23 ..	3,674	98	448	579	70	22	..	..
Fête Night ..	14,293	..	..	2,692	..	..	..	..
July 24 ..	30,560	227	1,366	2,955	152	24	1	..
,, 25 ..	23,384	195	1,169	2,740	144	16	1	..
,, 26 ..	33,888	184	1,465	4,129	148	19	1	..
,, 28 ..	23,896	171	1,134	2,727	114	20	2	..
,, 29 ..	26,103	199	1,216	2,864	145	23	..	..
,, 30 ..	18,979	205	980	3,179	109	29	2	..
,, 31 ..	31,248	227	1,367	3,653	141	20	2	..
Aug. 1 ..	23,114	180	998	2,922	124	30	14	..
,, 2 ..	38,513	163	1,364	5,768	92	29	1	..
,, 4 ..	71,884	259	2,453	9,567	124	21	..	..
,, 5 ..	43,920	240	1,804	3,890	161	18	..	..
,, 6 ..	19,126	214	1,018	3,167	116	16	..	..
,, 7 ..	33,643	228	1,546	3,422	169	30	12	..
,, 8 ..	22,118	151	958	2,748	117	28	..	..
,, 9 ..	32,487	120	1,104	4,697	101	30	..	..
,, 11 ..	23,287	134	880	2,416	99	35	..	1
,, 12 ..	25,005	130	1,104	2,396	117	39	2	1
,, 13 ..	14,879	139	823	2,210	103	24	1	2
,, 14 ..	28,118	167	1,211	2,839	133	27	..	2
,, 15 ..	19,337	154	891	2,145	132	27	4	1
,, 16 ..	37,930	149	1,167	5,325	116	27	2	..
,, 18 ..	30,138	183	1,321	2,942	138	26	4	..
,, 19 ..	28,045	210	1,367	2,682	165	26	4	..
,, 20 ..	15,486	206	819	2,707	92	24	7	..
,, 21 ..	30,558	195	1,281	2,837	126	30	3	..
,, 22 ..	19,707	124	847	2,262	125	26	3	..
,, 23 ..	44,936	148	1,412	5,670	127	24	1	..
,, 25 ..	28,894	142	1,152	2,758	130	24	8	..
,, 26 ..	31,879	187	1,452	2,572	161	24	4	..
,, 27 ..	11,162	186	827	1,418	120	25	10	..
,, 28 ..	25,032	175	1,152	2,359	155	26	6	..
,, 29 ..	18,012	119	945	1,785	145	35	4	..
,, 30 ..	38,034	148	1,498	4,381	118	22	10	..
Sept. 1 ..	31,284	179	1,463	3,218	152	24	10	..
,, 2 ..	28,814	158	1,459	2,525	96	27	4	..
,, 3 ..	14,460	183	1,129	2,276	93	30	15	..
Carried forward	2,422,635	27,013	115,763	301,301	13,079	1,762	140	7

Date.	Number of Visitors.	Catalogues.	Guides.	Musical Programmes.	Cookery.	Handbooks.	Lectures and Conferences.	Historical Costumes.
Brot. forward	2,422,635	27,013	115,763	301,301	13,079	1,762	140	7
Sept. 4 ..	18,300	133	1,119	1,719	103	28	11	..
,, 5 ..	23,868	134	1,159	2,180	134	30	7	..
,, 6 ..	36,917	158	1,409	4,767	161	26	5	..
,, 8 ..	40,931	178	1,679	3,516	184	24	10	..
,, 9 ..	29,382	176	1,281	2,685	164	26	7	..
,, 10 ..	16,529	199	1,111	2,566	124	23	10	..
,, 11 ..	31,502	168	1,342	2,880	160	22	4	1
,, 12 ..	20,643	156	995	2,391	124	27	11	..
,, 13 ..	56,349	151	1,831	6,261	142	26	5	1
,, 15 ..	55,971	235	1,983	4,742	173	23	3	..
,, 16 ..	31,246	197	1,425	2,553	152	29	4	..
,, 17 ..	19,712	203	1,165	3,104	123	19	5	..
,, 18 ..	36,111	161	1,365	3,642	145	40	2	..
,, 19 ..	20,708	121	988	2,210	119	20	4	1
,, 20 ..	50,869	141	1,543	6,128	127	24	7	..
,, 22 ..	44,135	197	1,539	3,880	132	17	1	..
,, 23 ..	28,291	158	1,115	2,264	131	20	2	..
,, 24 ..	15,866	225	1,023	2,149	111	19	15	..
,, 25 ..	36,116	154	1,374	3,141	155	16	8	1
,, 26 ..	20,651	124	922	2,322	119	24	11	3
,, 27 ..	40,144	118	1,398	4,700	131	20	2	13
,, 29 ..	46,703	176	1,734	3,754	156	19	11	9
,, 30 ..	36,763	155	1,450	2,524	178	18	9	11
Oct. 1 ..	15,780	169	998	2,312	126	29	10	34
,, 2 ..	40,084	147	1,483	2,775	205	32	8	14
,, 3 ..	23,526	119	980	2,656	136	27	7	11
,, 4 ..	58,095	152	1,742	6,244	123	23	3	10
,, 6 ..	42,441	119	1,392	3,499	132	24	10	11
,, 7 ..	33,697	148	1,372	2,683	148	26	11	20
,, 8 ..	17,347	262	1,200	1,592	160	34	21	39
,, 9 ..	38,411	149	1,400	2,607	165	24	17	21
,, 10 ..	19,893	85	963	2,045	124	24	5	49
,, 11 ..	49,145	141	1,551	4,887	161	26	7	7
,, 13 ..	45,358	177	1,359	3,741	173	24	5	7
,, 14 ..	36,057	154	1,297	2,493	179	25	9	..
,, 15 ..	17,369	229	1,078	2,274	153	27	4	41
,, 16 ..	44,984	185	1,430	3,142	175	59	21	30
,, 17 ..	24,239	139	992	2,550	149	52	20	16
,, 18 ..	50,952	125	1,324	5,421	155	38	3	64
,, 20 ..	54,692	190	1,420	3,949	188	55	4	45
,, 21 ..	41,914	180	1,309	2,816	177	30	13	40
,, 22 ..	24,282	231	1,478	2,985	200	67	20	62
,, 23 ..	49,401	197	1,405	3,234	235	63	16	34
,, 24 ..	40,372	149	1,230	3,298	184	48	8	62
,, 25 ..	49,914	123	1,220	5,606	150	50	43	55
,, 27 ..	55,102	341	1,591	4,126	262	38	20	75
,, 28 ..	54,457	305	1,689	3,278	185	38	12	47
,, 29 ..	22,661	301	1,190	2,700	214	54	21	85
,, 30 ..	37,168	276	1,030	2,905	185	90	44	97
Sales through Agents, &c.	..	608	41,044	..	2,069	9,637	1,587	212
Total.	4,167,683	36,232	221,880	463,097	22,838	12,966	2,243	1,235

OFFICIAL GUIDE.



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INTRODUCTION.

NOTE.—*The Coloured Ground Plan will be found between pages* 28 *and* 29, *and the Index at page* 51.

THE International Health Exhibition is the second of a series held under the patronage of Her Majesty the Queen, and under the Presidency of H.R.H. the Prince of Wales, and inaugurated last year with the Fisheries Exhibition. Before going the round of the buildings and examining their contents, it may be of interest to the visitor to know something of the objects which the promoters of this Exhibition had in view, and of the scope which they intended it to possess. During the last quarter of a century the attention of civilised nations has been devoted, in a very marked degree, to the scientific study of all questions relating to the preservation of the health of human beings. Formerly these matters were very imperfectly understood. For instance, it was not known that the majority of the zymotic diseases were due to the insanitary condition of dwelling-houses; systematic drainage and water supply for towns and villages were not thought of; and in numbers of cases the water for domestic use was drawn from wells contaminated by leakage from cesspools. The fact that the dairy might easily become the centre of propagation of disease was never dreamt of till within the last few years. The effect of proper clothing on the health of the human body was ignored, while the various properties of different kinds of food, and the effects of different processes of cooking were but very imperfectly understood.

Objects and scope of the Exhibition.

Former ignorance regarding sanitary matters.

It is obvious that there is no branch of applied science which affects the comfort and civilisation of the human race in such a marked and intimate manner as does the science of sanitation. The greatest of blessings is good health, and health is dependent to a very great extent on the proper structure, drainage and ventilation of our dwellings, on the nature of the clothing we wear, and on the character and cooking of the food we eat. Sanitary science affects the welfare of every individual, and consequently a general knowledge of its fundamental principles and appliances should be widely diffused. For this reason there is no branch of knowledge which is more worthy to be the subject of a special Exhibition than the science of Health.

Importance of sanitary science.

The special objects of the Exhibition are "to illustrate as vividly and in as practical a manner as possible Food, Dress, the Dwelling, the School, and the Workshop, as affecting the conditions of healthful life, and also to bring into public notice the most recent appliances for Elementary School Teaching and instruction in Applied Science, Art and Handicrafts."

Special objects of the Exhibition.

Principal divisions of Exhibition. In order to carry out these objects systematically, the Exhibition is divided into two main sections, viz. (I.) Health, (II.) Education, and these principal subdivisions are further arranged in eight principal groups.

Subdivisions.

Food. The first group is devoted to the illustration of food supply and preparation. Specimens of food from various countries are exhibited, and also the methods of manufacturing, preparing, cooking, and serving food are practically demonstrated. Thus, for instance, such varying processes as the preparation and preservation of dairy produce, the making of bread by the most modern methods, the manner of supplying the Metropolis with water, the culture of honey, the arts of brewing beer and making wine and mineral waters, and cooking in all its branches are amply demonstrated.

Dress. The subject of the second group is Dress, which is illustrated chiefly in its relation to health. Thus there are exhibited specimens of every conceivable article of modern clothing, and of the materials from which they are made. The effect of various materials in aiding or in checking the natural functions of the skin has occupied the thoughts of many exhibitors; while, naturally, the mechanical injuries which certain articles of attire, notably boots and corsets, are capable of inflicting on the human body have received ample demonstration. Not only has the clothing in vogue in the present day received attention, but also the costume of the past, and the dress which certain reformers hope will be the attire of the future. The section of this group which relates to the history of costume is of unique artistic interest.

Dwellings, schools, and workshops. Groups III., IV., and V. illustrate all that pertains to the healthful construction and fittings of dwelling-houses, schools, and workshops. The sanitary arrangements of houses, such as efficient drainage and ventilating appliances, water supply, and cooking and heating apparatus, are comprised in these groups, and also fittings, furniture, and decorations, as affecting the health and comfort of the inmates. The subject of school construction is well illustrated; but perhaps one of the most interesting and important sections of this part of the Exhibition is that which deals with modes of combating and preventing the evils of unhealthy trades, occupations, and processes of manufacture.

Unhealthy trades.

Naval and Military Hygiene. Group IIIA. is devoted to Ambulances, Naval and Military Hygiene, and Naval and Military Hospitals. This group also contains illustrations of the fittings and furniture suitable for sick rooms, but civil hospitals and medical and surgical appliances generally do not come within the scope of the Exhibition.

Sick room fittings.

Meteorology. Group VA. treats of Meteorology in its relation to health.

Education. Group VI. relates to Primary, Technical, and Art Education, and contains exhibits of apparatus and appliances used in teaching; also diagrams, text-books, &c., and designs and models for school buildings. A most interesting portion of this group is the series of specimens of work designed by students at art schools throughout the country, and executed in many cases by large industrial firms. These comprise drawings, designs for statues, public monuments, pieces of decoration and artistic furniture, metal work, ceramic and glass ware, lace and other textile fabrics, and they serve to show the progress which is now being made in artistic education in this country. A considerable

Works by Students of Art Schools.

portion of Group VI. is contained in the building belonging to the Central Institution of the City and Guilds of London Institute, a large structure in red brick adjoining the Exhibition buildings proper, and which will, when opened, be the most important institution in London for the highest branches of technical education. City and Guilds of London Institute

Though the Educational section has nothing, properly speaking, to do with health, nevertheless, from the intrinsic importance of the subject, it cannot be doubted that it will form one of the most interesting portions of the Exhibition. Until within the last twenty years both art and technical and primary education were very much neglected in this country, which was in these respects far behind the principal nations of the Continent. The Science and Art Department has, however, done wonders within the last twenty-five years, in raising the level of education throughout the country in the special subjects with which it deals, and hence the interest which attaches to the collection of specimens of work designed by students in art schools. These specimens may, indeed, in some sort be accepted as a practical test of the efficiency and utility of the Department. Science and Art Department.

The Primary Education Act of 1870 effected, as is well known, a complete revolution in the elementary education of this country. An idea of the progress which has been effected since the passing of the Act may be obtained from the following figures, which form a comparison between the states of primary education in England and Wales alone in the years 1870 and 1882 :— Primary education.

	1870.	1882
Number of schools inspected by H.M. Inspector	8,281	18,289
Scholars on school registers	1,693,059	4,189,612
Teachers of all classes	28,033	76,709

A subject which has undergone such enormous and rapid development cannot fail to benefit immensely by an Exhibition such as this, where opportunities are afforded of comparisons between the methods, appliances, and text books of our own schools, and those of other and more experienced nations.

Technical education is still in its very infancy in Great Britain. The institutions for the development of the higher technical training are still unfortunately few and far between, while primary and intermediate technical institutions may almost be said to be non-existent, circumstances which place our own people at a great disadvantage compared with the principal European nations. Amongst the results to be attained by this Exhibition it is much to be hoped that the multiplication and improvement of our technical training institutions of all grades will be included. Technical education.

In order to carry out the important and onerous work embodied in the realisation of the above objects, an Executive Council under the Chairmanship of the Duke of Buckingham and Chandos has been selected by H.R.H. The Prince of Wales. This Council contains the names of several gentlemen representative of the professions and pursuits which the Exhibition illustrates, as well as of some who are distinguished for their skill and experience in organising these international displays. The Council has been assisted in its work by several special committees, which deal with the various groups and subsections. The names of these different committees are, 1. City Executive Council. Special Committees.

of London; 2. Food; 3. Dress; 4. The Dwelling House; 5. Ambulance; 6. The Workshop; 7. School and Education; 8. Technical Education; 9. International Congress on Education; 10. Meteorology; 11. Library; 12. Laboratory; 13. London Water Supply, and, 14. India. This method of organisation may by itself be taken as a guarantee that everything, which special knowledge, skill, and experience could suggest, has been done towards rendering the Exhibition, in all its branches, as complete and as illustrative as possible.

Having thus acquired a general knowledge of the nature, object and scope of the International Health Exhibition the visitor will be the better enabled to go through the various buildings, and examine their contents.

OFFICIAL GUIDE

TO THE

INTERNATIONAL HEALTH EXHIBITION.

NOTE.—*The Coloured Ground Plan will be found between pages* 28 *and* 29, *and the Index at page* 51.

I.—GENERAL ARRANGEMENT OF BUILDINGS AND GROUPS.—BEST METHOD OF VISITING THEM.

BIRD'S-EYE VIEW OF BUILDINGS—ARRANGEMENT OF GROUPS AND SUBJECTS—FOREIGN COUNTRIES—DINING AND REFRESHMENT ARRANGEMENTS—THE GROUND PLAN AND MODE OF NUMBERING IT—BEST ROUTE TO TAKE THROUGH EXHIBITION.

Bird's-eye view of buildings, &c.

BEFORE starting on a round through the immense number of courts, galleries, arcades, and detached buildings, which contain the various objects constituting the International Health Exhibition, the visitor will do well, with the aid of the General Plan, to acquire a sort of bird's-eye view of the arrangement of the buildings and groups of subjects. The Albert Hall is at the northern end of the Exhibition, while the south faces the New Natural History Museum in the Cromwell Road. The principal entrance is on the eastern or Exhibition Road side, and there is also a western approach in Queen's Gate. Bearing this explanation in mind, the visitor will have no difficulty in attaching a meaning to such designations as South Gallery, East Central Gallery, Western Arcade, &c., which are of frequent occurrence. The buildings are the same as those used for the International Fisheries Exhibition last year, but, on account of the far greater size of the present collection, a large number of new annexes, courts, corridors, and detached buildings have been recently constructed, which add greatly to the intricacy of the ground plan; while, in addition, some of the galleries of the Royal Albert Hall and the buildings of the City and Guilds of London Institute have been brought into requisition.

Arrangement of groups. Food.

As the great bulk of the objects exhibited is of British origin or manufacture, so the general arrangement of the Exhibition is not one of countries, but of groups of subjects. Generally speaking, the Food Group occupies the buildings at the extreme southern end, in immediate proximity to the principal, or eastern entrance. The northern end, including some of the galleries of the Albert Hall, is devoted to Dress. Historical dress occupies the West Quadrant flanking the Conservatory; modern clothing, the opposite or East Quadrant;

Dress.

while ladies' and children's hygienic under-clothing will be found in one of the galleries on the eastern side of the Albert Hall.

Machinery in motion. The Western Galleries, and some of the other western buildings, contain the machinery in motion, which relates principally to the manufacture of food, of clothing, and the production of the Electric Light. The Western Arcade contains the Aquarium. On the eastern side we find stoves ranges, and heating apparatus generally exhibited in the Eastern Arcade. Sanitary drainage appliances in the East and South Annexes, while the East, West, and South Central Galleries, and part of the East Gallery, are given up to the dwelling-house and school, their furniture, fittings, and decorations. The large Central Gallery, running east and west, contains the objects of industrial art, designed and in some cases executed by the students of various Art Schools throughout the country. The Pavilion of the London Water-works Companies stands between the South and the South Central Galleries, adjoining the Prince of Wales' Pavilion, which will be well remembered by visitors to last year's Exhibition, and the same Companies have also combined to produce the great fountain in the gardens, which is a feature of special interest in this year's collection.

Heating apparatus. **Sanitary apparatus.** **Dwelling and school houses.** **Industrial art.** **London water-works Companies.**

Albert Hall and its galleries. The Albert Hall Galleries, with the exception of the portion already referred to as containing a portion of the Dress Exhibition, has been given up to the Library and Reading Room, and to Education, while the Hall itself is utilised for musical performances, when the weather is too bad to permit of the military bands playing in the Gardens.

Foreign countries. Many foreign countries have sent objects or collections to the Exhibition. These are to be found for the most part in the West Central, and part of the South Central Galleries. France, which is represented partly in these Galleries, will have a large Educational Exhibition in the Central Institute of the City and Guilds of London at the extreme eastern side, close to the Exhibition Road.

France.

China. China occupies its old quarters in the East Gallery, but its collection, on the present occasion, will be found to be much larger than last year, and there is, in addition to the Exhibition proper, a most interesting feature in the shape of a Chinese tea-garden in the grounds.

Japan The Japanese collection is split up; the largest portion is in the Old Conference Hall, on the right hand side of the entrance vestibule. A Japanese dining-room is to be found on the terrace on the roof of the East Arcade. A tea-house occupies a site in the grounds near the Water Companies' Pavilion, and the remainder of this exhibition is in the South Central Gallery.

Belgium The Belgian Exhibition, which is very large, is provided for in a separate building of considerable size, called the Queen's Gate Annexe, which lies to the west of the Aquarium. A portion of this building is given up to the Ambulance and Naval and Military hygiene. India has a site at the western end of the Central Gallery, and has also tea-gardens and coffee-pavilions in the grounds. A portion of the Indian gallery is given over to Siam.

Ambulance. **India.**

Dining-rooms and refreshments. The dining-rooms and refreshment bars will be found scattered all over the buildings, in convenient situations, and will be specially referred to in their proper places. The general refreshment contractors are Messrs. Bertram & Roberts, but the National Training School of

Cookery has also two dining-rooms as well as a demonstration theatre. The Manchester Vegetarian Society has a large educational vegetarian restaurant, and in addition there are several cheap coffee stalls, one of which is similar to Sir Philip Cunliffe Owen's stall opened last year at the Fish Market. China and Japan have each restaurants and tea-rooms in which the national cookery of the two countries is exemplified. There are also chocolate and cocoa rooms, while milk, cream, and butter-milk can be had at the counters in front of the dairies, from which it is abundantly evident that provision has been made for the most varied tastes in the matter of eating.

Armed with the above general information, and aided by the ground plan of the buildings, the visitor who wishes to make his way at once to some special section of the Exhibition will have but little difficulty in accomplishing his object. The general sightseer will, however, no doubt prefer to go systematically through the various groups and buildings, and on this tour we now propose to conduct him.

Numbering of ground plan.

It should be noted that the coloured ground plan supplied with this Guide is dotted all over with numbers, which refer to the page of the Guide containing the description of the special portions of the buildings marked with the numbers. Thus, for instance, the dining rooms of the National Training School of Cookery are marked with the number which denotes that p. 13 of the Guide refers to these rooms. By this method a visitor finding himself in any portion of the buildings can at once find the description he may require, as he has only to look out the name of the building, which is usually posted up in some conspicuous position, and a reference to the ground plan will give him the number of the page. The coloured illustrations have been produced with the assistance of photographs, kindly lent by the London Stereoscopic Company.

Coloured illustrations.

Best way of visiting Exhibition.

The best method of visiting the buildings is to commence at the Main Entrances in the Exhibition Road, and walk through the South Gallery with its dependent buildings to the extreme western end, and then turn to the Right and go through all the circumferential buildings with their annexes until he has once more reached the spot whence he set out. The Central Galleries together with the old London Street, and the Prince of Wales's and the Water Companies' Pavilions can be taken next, and the detached buildings and the Gardens last.

II.—THE ENTRANCES AND SOUTH GALLERY WITH ITS ANNEXES.

ENTRANCES — VESTIBULE — OFFICIAL PUBLICATIONS — JAPAN — CHEAP DINING ROOMS—DUVAL'S SYSTEM—ARCHITECTURAL DRAWINGS—SOUTH GALLERY—SEEDS—STUFFED ANIMALS—FIRST CLASS DINING ROOMS—SCHOOL OF COOKERY—BEES—METEOROLOGY—BAKERIES—BEER AND WINE—DAIRIES—UTENSILS—VEGETARIAN DINING ROOMS.

Principal entrance.

THE great majority of visitors will arrive at the Exhibition by the principal entrance in the Exhibition Road, situated just opposite the South Kensington Science Schools, and about a quarter of a mile from

Railway communications. the South Kensington Station of the Metropolitan and District Railways, by means of which lines access to the Exhibition may be easily obtained from almost any part of the Metropolis. Immediately on passing the

Vestibule. turnstiles, the visitor finds himself in the Vestibule, a building with an arched wooden roof, which has been wisely kept free from large objects of exhibition, in order to prevent the choking of the main thoroughfare by crowds of sightseers. The Vestibule is, however, not without interest, for it contains a beautiful reproduction of the equestrian statue of the Prince of Wales, executed by Mr. Boehm, R.A., and presented

Advertisements. by Sir Albert Sassoon to the municipality of Bombay. The walls of this building also show how decoration and advertisement may be harmoniously combined, and the example here set is one which might well be copied in the interiors of such buildings as railway stations, which are, as a rule, rendered in the last degree unsightly by the indiscriminate use of placards. While talking of the essentially nineteenth-century art of advertising, it may be mentioned as a curious fact that the reserve price put upon the back cover of the Official Catalogue for advertising purposes was a thousand guineas. At the Paris Exhibition the back covers of both the French and English catalogues were taken at a thousand guineas each by Messrs. J. and J. Colman, while the inside

Catalogues and official publications. covers went for six hundred guineas a-piece. The catalogues, guides, and handbooks, as well as all other official publications, are on sale in the Vestibule at the stalls of Messrs. William Clowes & Sons, Limited, the official printers and publishers to the Exhibition. The catalogues, with their valuable prefatory matter, as well as the official Handbooks and other publications, are, as was the case last year, produced under the able direction of Mr. A. J. R. Trendell, the Literary Superintendent of the Exhibition.

Japan. On the right hand side of the Vestibule is the entrance to the Conference Hall, which has been recently given up to a portion of the Japanese Exhibition. This room contains many curious and beautiful specimens of ancient and modern Japanese industry. Side by side with the rich silks and quaint shapes of the old court costumes may be seen the modern uniforms which are in all respects European in their character. Here also are to be found models of houses, pieces of furniture, cooking utensils, and the beautiful leather papers and mats for which the Japanese are so justly celebrated.

Modern progress is illustrated by drain-pipes and other sanitary appliances, hospital equipments, and flannels and other dress materials of native manufacture.

Beyond the Entrance Vestibule is the old Council Chamber of the Royal Horticultural Society, which was last year used as a fine art gallery, but is on the present occasion very wisely kept as an open space. On the right hand side of this Court, as the visitor looks down the long South Gallery, will be found the entrance to what was the old Fish Market, but which is now converted into Messrs. Bertram &

Cheap dining-rooms. Roberts' popular dining saloon. The room is divided down the middle, by a railing, into two halves, one of which is given over to the fixed price shilling dinners and shilling teas, while those who prefer to choose their own dishes from the bill of fare of the day, are accommodated in the other half, where all possibility of mistakes in the reckoning is avoided by the adoption of the system so largely made use of in Paris

at Duval's Restaurants. Each diner is provided with a bill of fare on which the prices are marked, and each dish, as ordered, is entered on the account which is left on the table during the whole of the repast, open to the inspection of the guest, who can readily compare the prices, as charged, with the figures on the bill of fare. The far end of this dining saloon is closed by plate glass windows, behind which the cooks may be seen at work preparing the various dishes. **Duval's system.**

Returning now to the Council Chamber, and going straight on, we find ourselves in a long corridor running north and south, immediately at the top of the steps leading down to the Great South Gallery. This corridor is given up to architectural drawings of the façades and interiors of dwelling houses and other buildings, and many of them will be found well worthy of inspection, not merely for their artistic value, but because of the attention which has been bestowed on rational modes of construction, and on sanitary matters, as well as heating, lighting, and ventilation. **Gallery of architectural drawings.**

The visitor who is interested in house construction, having inspected these designs, will naturally return to the flight of steps and descend to the South Gallery, which is devoted to the Food Group. The body of the gallery contains innumerable samples of preserved provisions, stuffed examples of animals, seeds and roots used for food for men and animals, preserved provisions, wines, beer, mineral waters, and other drinks, and appliances used for feeding and cooking. This gallery, with its handsome arched roof, is the largest and most imposing continuous structure in the Exhibition, but in spite of its dimensions it has been found quite inadequate to accommodate all the objects which have been sent in for exhibition in this group, and accordingly numerous annexes and corridors have been added to it on both sides, those on the north side contain the bakeries and bees, while those on the south are given up to dining-rooms and dairies. On entering the South Gallery the most prominent object before the visitor is the really fine collection of seeds, foods, models, and drawings of Messrs. Sutton & Sons of Reading. Other excellent displays of the same nature in the immediate neighbourhood are by Messrs. James Carter & Co., Messrs. J. C. Wheeler & Son, and Messrs. E. Webb & Sons. **South gallery.** **Food exhibition.** **Annexes to South gallery.** **Seeds.**

There are several stuffed specimens of animals fit for food in this part of the gallery, one of the most remarkable being Her Majesty the Queen's prize heifer, Cherry Blossom, stuffed entire by Mr. Geo Butt. Another well-arranged collection in this category is by Messrs. Rowland, Ward & Co., who have two large cases, one containing stuffed specimens of edible birds and small game which come in to the London Markets, the other representing a gabled building being filled with beautiful specimens of stuffed poultry. Messrs. Keilich & Sons have some fine specimens of heads of deer, bison, &c., and Mr. E. Meek shows a variety of stuffed examples of game birds. In this section Mr. Tallerman exhibits fresh mutton and beef from Australia, New Zealand, South America, and Russia. **Stuffed animals.**

On the southern side of this end of the Gallery are the large dining-rooms of Messrs. Bertram & Roberts, where first-class dinners *à la carte* are served, and also the luncheon and tea-rooms of the same firm, while a little farther, on the same side, are the rooms in which the Executive Committee of the National Training School of Cookery, **Dining rooms.** **School of cookery.**

have undertaken to supply cheap dinners to the Public. In the old fish dining-room, a portion of fish, or meat, bread, and potatoes is served every day for sixpence.

In the other dining-room, a dinner of two courses, consisting of either hot or cold joint, and soup, fish, or pudding, according to the day of the week, together with bread and potatoes, is provided every day, for a shilling. Tea and coffee are served in both rooms. In the theatre, situated between these rooms, demonstration lessons on various branches of cookery will be given at intervals during the day. The subject of the morning lessons will be the dinners that will be served in the dining-rooms for the day. This lesson will be free. The subjects of the other lessons will be announced shortly. The entire management of this Department is under the Lady Superintendent of the National Training School for Cookery—Mrs. E. Clarke—whose name will be gratefully remembered by many visitors to last year's Exhibition, in connection with the cheap fish-dinners, and the demonstrations in the art of fish-cooking. The recipes for the above dinners are for sale in the Exhibition, at three-pence per copy.

Bee culture. Exactly opposite these dining-rooms, on the north side of the Gallery, the visitor who is interested in Bee Culture, will find in the so-called East Corridor Annexe, the collection of frame and straw hives' extractors, comb foundations and other appliances used in bee keeping, together with specimens of pure and adulterated honey, and of the articles used as adulterants, contributed by the British Beekeepers' Association.

Meteorological instruments. In the same Corridor is to be found the collection of Meteorological Instruments, consisting for the most part of thermometers, barometers, hygrometers, instruments for recording the amount of sunshine, anemometers, rain-gauges, and such-like appliances, exhibited by many of the most eminent makers. The Royal Meteorological Society has a typical climatological station in the grounds, fitted up with instruments, and containing diagrams illustrative of the climatic conditions prevailing in various parts of the world. Adjoining the meteorological instruments is the so-called Anthropometrical Laboratory, arranged by Mr. Francis Galton, in which visitors can have their principal physical dimensions taken, their hearing power and accuracy of eyesight ascertained, and their strength tested.

Anthropometrical laboratory.

Bakeries. Opening out of this part of the Exhibition, is the East Corridor, which is given over to Bakeries and Ovens. Here can be seen several complete bakehouses, furnished with the most improved modern ovens, and breadmaking machinery, shown in actual operation, by several well-known firms of London bakers and confectioners. Anyone who has read the correspondence which appeared some little time ago in the daily papers, and the accounts of the special reporters who went the round of the London bakehouses, will remember the unpleasant pictures which were drawn of the primitive and unsanitary condition of these establishments, and will welcome the efforts made in this part of the Exhibition towards effecting a much-needed sanitary reform. A great majority of the ovens actually in use throughout the country, are heated by lighting the fire in the very chamber in which the bread is afterwards placed for baking. This fire is withdrawn when the oven is heated up to the proper temperature; but the chamber is of

Insanitary condition of ordinary bakehouses.

Old-fashioned ovens.

course always more or less contaminated with the products of combustion. Nearly all the ovens exhibited in the East Corridor are heated by flues quite distinct from the baking chamber or oven proper, so that the products of combustion never come near the bread. In some cases coal, in others coke, and yet in others steam or gas is employed as the means of heating. The method of heating the ovens is not the only weak point connected with the system of making bread actually practised in the majority of cases; the various operations are, as a rule, carried out by hand, and no guarantee exists of the cleanliness or freedom from infection of the hand-workers. In the Exhibition the various processes are carried out by machinery as far as possible, so that the handling of the bread is reduced to a minimum. The hand work of mixing and kneading, which is so objectionable when carried out in the old-fashioned manner, is in the better class of bakeries superseded by the use of machinery.

Modern ovens with the separate flue system.

Commencing at the eastern end of the Corridor, we find a model bakehouse exhibited by Mr. J. Marshall, and fitted with the latest improvements in ovens and machinery, all of which are to be seen in operation. Amongst the objects worthy of inspection, is one of Gibson & Bover's gas-furnaces applied to an ordinary ten-bushel baker's oven. It is stated that this apparatus can be easily fitted to any existing oven of the old type, at a cost of about £25. The advantages claimed for it are that the oven can be heated without smoke, dust, or noxious fumes, in a much shorter time than by the old process. The advantages to health are obvious, and it appears probable that the first outlay would be quickly recouped by the increased work to be got out of the oven.

J. Marshall's bakery.

Messrs. Hill & Sons are running a large bakery fitted up with two of Mason's hot-air continuous baking ovens, one of which is supplied with a tramway and travelling baking plate, which can be charged with all the things to be baked before it is run into the oven. Thus the oven is charged at one operation, and it is never necessary to open the door after the charge has been introduced till the process of baking is complete. Moreover, all the loaves remain exactly the same time in the oven, an advantage which could not be secured by the old method. Both of these ovens are fitted with pyrometers to show the temperature. In this bakehouse are to be seen some of Pfleiderer's combined kneading and mixing machines, and various other apparatus used in bread-making. Mr. Pfleiderer's machines are all constructed with a view to reduce labour to a minimum, and to form an inducement to the workmen to perform the operations as far as possible without touching the bread by hand.

Messrs. Hill & Sons' bakery.

Mason's ovens.

Pfleiderer's bread-making machinery.

Messrs. Perkins & Son show some specimens of their steam-heated ovens, one being a ship oven, and another arranged on wheels, so as to be portable for military purposes. The arrangement adopted by Messrs. Perkins is ingenious, and secures a uniform temperature in every part of the oven. It consists of a row of wrought-iron tubes at the crown, and another below the bottom plate of the chamber to be heated. These tubes are welded up at the ends and contain a little water, and are set slightly slanting, so that their lower ends come into the furnace. The water contained in the tubes is quickly turned

Perkins's steam ovens.

into steam of high pressure and temperature, which carries the heat uniformly to every portion of the oven. When it is cooled down the water in the tubes condenses and is ready for use over again. Visitors will remark the very small furnaces required for these ovens. The same firm exhibit their apparatus for ventilating and warming buildings. The large oven, set in white glazed bricks, is worked by Messrs. Harris & Co., who produce confectionery, cakes, and fancy bread, and who show in operation many machines used by confectioners.

Messrs. Baker's bakery.

Messrs. Joseph Baker & Sons also exhibit a complete bakery, with a number of machines employed in bread making and confectionery; also two ovens, one of which is lined with stone and heated with coke, while the other, called an American oven, is lined with tiles and heated with coal, and is said to be very useful for baking pastry and fancy articles. This bakery is run by Messrs. T. Watt & Sons, who have also a refreshment bar adjoining.

In this section of the Exhibition are also to be seen several samples of bread-making machinery, yeast presses, and pulverising mills, contributed for the most part by Messrs. Richmond & Chandler, Messrs. J. J. Musto & Co., and the Globe Mill Company. The machinery in motion in the various bakeries is driven by the well-known Otto Gas Engines.

Returning now to the South Gallery by the entrance near to the working bees, we soon find ourselves in the portion of the Exhibition devoted to prepared vegetable substances used as food, including tinned and preserved fruits, biscuits, cakes, and prepared cereals. In this department many firms of world-wide repute are represented, such, for instance, as Messrs. Huntley & Palmer, Messrs. Peak, Frean & Co., Messrs. Brown & Polson, Messrs. J. & J. Colman, Baron Liebig, and some of the large jam and chocolate houses. The processes of jam-making and chocolate manufacture are exhibited in the West Gallery, which contains the machinery in motion. Prominent in this part of the gallery is the huge lager-beer cask exhibited by the Austro-Bavarian Lager Beer Brewery and Crystal Ice Factory, Tottenham, which is the only brewery in London built to brew lager-beer. The beverage produced by this firm can be obtained at Messrs. Bertram & Roberts' bar in the Belgian Court. There is also to be seen the arbour, or Weinlaube, as used in Austrian vineyards, erected by the Administration of the Weinlaube, Klosterneuburg, near Vienna; the firm also exhibits Austrian and Dalmatian wines, wine-making appliances, and instruments for analysis. There is in attendance a peasant girl in Dalmatian costume. There are many other Exhibitors of malt liquors and of well-known European, as well as of Australian, American, and even Syrian wines; but it will probably be a surprise to most visitors to learn that wine from the grape is made nowadays in England, even if only as a curiosity. Such is, however, the case, for Mr. J. Parker, of Woodstock, exhibits samples of red and white, still and sparkling wines made from English grapes grown out of doors, and under glass. Many of the best-known makers of mineral and aërated waters are also well represented.

Preserved provisions.

Austro-Bavarian Lager-Beer Brewing Co.'s giant beer cask.

Austrian Weinlaube.

English wine.

Dairies.

One of the most interesting sections of the entire Exhibition is to be found on the south side of this part of the Gallery. We allude to the several large dairies in which are shown all the most modern

methods of keeping cows, of separating cream from the milk, and of making butter, cheese, and other dairy produce.

The first of these is a small model dairy of four rooms, all lined with white tiles, and fitted with Messrs. T. Bradford & Company's latest appliances for making butter. The methods of draining and of cooling and ventilating this dairy deserve special attention. **Bradford & Co.'s dairy appliances.**

The second, erected and worked by Messrs. Welford & Sons, Limited, will at once strike the eye, as much on account of the beauty of the building as because of the completeness of the exhibit. The front looking on to the Gallery represents a picturesque farm-house. The interior contains a shed of six Alderney cows in stalls, and four goats in a paddock, both stalls and paddock being provided with Musgrave's patent cow and goat fittings, and all the latest sanitary arrangements as approved by the Sanitary Assurance Association. Several Zulu sheep are also exhibited. There is also a can-cleaning room, offices, butter-making department, and laboratory. The buildings are tastefully lined with tiles, and the windows filled with stained glass. The celebrated Swedish cream separators (G. de Laval's patent) are exhibited in operation. Lectures are delivered daily on the art of butter-making, and the processes of testing and analysing milk are also demonstrated. **Welford & Sons' dairy.**

The modern methods of making butter as practised in this dairy may interest many readers. The milk as it comes from the cow is put into tin vessels, which are placed on one of Lewis's patent milk raisers, and upset into a tank or receiver, which stands about eight feet above the floor. From thence it passes through cloth strainers to the cream separator, where the cream is abstracted in a continuous stream. The action of these separators is extremely ingenious. The milk enters a rapidly-revolving vessel, which by centrifugal action causes the light cream particles to rise to the top, while the skim milk remains at the bottom. Two openings are provided: one on the higher level by which the stream of cream flows off, and the other lower down, which carries away the skim milk. By means of this machine the cream from one hundred imperial gallons of milk can be abstracted in an hour and a half, whereas by the old process it would have to stand for twenty-four hours, during which time, if the weather were unfavourable, it might turn sour, and be completely spoiled. It would then have to be skimmed by hand, in which process a certain quantity of milk is always carried off, which impoverishes the cream.

After separation, the cream is poured into one of Taylor's, Bradford's, or Wade's patent churns, and is converted into butter in about twenty minutes. The butter is then removed from the churn, and the butter-milk and water are carefully pressed out in one of Bradford's butter-workers. If allowed to remain in, the water and butter-milk would destroy the keeping properties of the butter. After this, the butter is placed in a Danish cooler or hardening-box for a couple of hours, when it is ready for working into pats. Exclusive of the time required for hardening, it only takes two and a half hours from the time the cows are milked to make forty pounds of butter. A hundred gallons of milk, yielding thirty-six quarts of cream, are required to produce this quantity.

We next come to the dairy of the London and Provincial Company, **London**

and Provincial Dairy Company.

which contains a very complete collection of everything in the way of live stock, poultry, vegetable, fruit, bulb and seed products, utensils and machinery, which can possibly be required for, or produced on a first-class English dairy farm. Various classes of cheeses, butters, natural and artificial milks, and other produce are exhibited, and several methods of cream extraction, and butter and cheese making demonstrated. The most approved methods for preserving dairy produce by chemical means in refrigerators, and by means of cold, dry air machines are also illustrated; and, at the same time, every attention has been paid to the subject of the transport and distribution of the more perishable articles for consumption. The construction and appointments of this Dairy are in every respect first-class. The interesting collection of pure and cross-bred prize poultry of all kinds is exhibited at the corner of the South Gallery opposite the shed containing the machinery for generating the electric light.

Express Dairy Company.

Next door to the above company, the Express Dairy Company has a large and most picturesque building, in which all the modern processes connected with the production of milk, and the manufacture of butter, cheese, &c., are demonstrated with the same completeness as in the preceding cases. The machinery used in this building has been supplied by the Dairy Supply Company, Limited, of Museum Street, W.C.

Visitors who are interested in the question of dairy farming in all its branches, cannot do better than make a complete study of the exhibits of these four firms, for amongst them they will find all that is most modern and most important connected with this branch of farming. The appliances connected with sanitation, with the separation of the cream from the milk, and with the preservation of dairy produce, will no doubt command special attention.

Feeding appliances and cooking utensils.

In the South Gallery, opposite the Dairies, is an instructive collection, illustrating the chemistry and physiology of food, lent by the Science and Art Department. The remainder of the Gallery is devoted principally to feeding appliances and utensils for infants and adults, and to various patented foods. There are also to be found here collections of cooking pots and utensils in fireproof china, and in enamelled and tinned metal wares. Several fine cases of electro-plate and cutlery by well-known firms will, no doubt, be noticed. Visitors will admire on the north side of the Gallery the very beautifully decorated Eastern Coffee-house, provided with Sir Philip Cunliffe Owen's coffee-machines.

Vegetarian Society.

The last building opening out of the south side of the Gallery is the restaurant belonging to the Vegetarian Society, the headquarters of which are at 75 Princes Street, Manchester, the President being Professor Francis Newman. In this dining-room there will be served sixpenny vegetarian dinners from 11.30 A.M. to 9.30 P.M., and also choice dinners from the daily bill of fare. No fish, flesh, or fowl will be used in this restaurant. The room is very efficiently ventilated by the Æolus Water-Spray and General Ventilating Co. Vegetarian cookery books and literature can be had at the counter. The profits are to be devoted to the feeding of the poor in our large cities during the coming winter.

Tayler Smith's house.

Immediately beyond the Vegetarian dining-rooms and on the same side of the South Gallery, is an ornamental iron gateway, leading to

the House put up by Mr. Tayler Smith, and prettily furnished by Messrs. Jenks and Wood. One of the remarkable features of this house is the arrangement of the electric light which has been very carefully thought out by Mr. Smith. The electricity is generated by small gas engines, and is stored in accumulators of the Planté type made by Messrs. Parker & Elwell of Wolverhampton. The nailless flooring and the iron covered way, the latter made by the Coalbrookdale Co., are also specially deserving of attention. Attached to this house is a pretty fernery, erected by Messrs. Pulham & Son, which firm also exhibits a red concrete mullioned window, several dwelling houses, accessories in terra cotta, and also a number of garden vases, balustrades, pedestals, &c., in the same material: the majority of the latter are outside the Belgian Court.

Convict prisons.

At the extreme end of the Southern Gallery are some interesting models of convict prisons and cells, and specimens of the rations served out to convicts.

South Annexe.

The South Annexe, on the north side of this end of the Gallery, is chiefly filled with sanitary earthenware appliances which are of much importance to specialists, and to the ever-increasing class of general visitors who take an interest in the sanitary condition of their house-drainage.

If we now turn to the right, at the end of the South Gallery, i.e. proceed in a northerly direction, we enter one of the grill-rooms of Messrs. Bertram & Roberts, at which are served chops of the now celebrated New Zealand mutton, which arrives in this country in a frozen condition. Close by, in the top of the Arcade, is a buffet, and a so-called smoking café, where the public can smoke under cover on an elevated terrace which commands excellent views of the grounds.

III.—THE AMBULANCE—THE BELGIAN COURT—THE AQUARIUM.

ENGLISH HOSPITAL APPLIANCES—THE BELGIAN EXHIBITION—BELGIAN AMBULANCES—PRIMARY EDUCATION IN BELGIUM—TRAINING COLLEGE FOR TEACHERS AT BRUGES—SCHOOLS OF THE CHRISTIAN BROTHERHOOD—THE AQUARIUM.

Queen's Gate Annexe. Ambulance.

Beyond the last-mentioned grill-room we find a corridor on the left-hand side which gives access to a large and tastefully-decorated building called the Queen's Gate Annexe, which is given over to the Ambulance, and Naval and Military Hygiene, and to Belgium. Starting at the southern end of this building, we find ourselves in the portion devoted to the ambulance hospital and sick rooms. Here are to be found specimens of the latest appliances for the removal and care of the wounded, and for the comfort of invalids and cripples. The ambulance waggon, and other objects contributed by the Army Medical Department, Whitehall, deserve attention.

Belgian exhibition

Going northwards we enter the space reserved for Belgium. The Belgian collection is one of the largest contributed to the Exhibition by any foreign country. It occupies about five-sixths of the space in the

Queen's Gate Annexe. By far the greater number of the exhibits have reference to the subject of primary education, which is really most exhaustively treated; but there are also collections of furniture, hospital appliances, preserved foods, and a few pieces of machinery.

Belgium ambulances.

Immediately on leaving the section devoted to English Hospital Accessories we enter the portion of the Belgian Court which has reference to the same subject. Here are exhibited ambulances and hospital and medicine wagons by the Minister for War, and the City of Brussels sends samples of carriages used for transporting sick people from their homes to the hospitals. These are public vehicles, and means are provided for their immediate disinfection when they have been used for transporting patients suffering from infectious diseases.

Belgium furniture.

Close by are some exhibitions of furniture, chiefly in oak, for the production of which Belgium is celebrated. There is also a drawing-room panelled in oak, which is exceedingly well carried out.

Primary education in Belgium.

The remainder of the building is divided down the centre into two long courts, the greater portion of one of which is taken up by the Minister of Education. The walls are hung with architectural plans and drawings which illustrate many of the primary schools in the country, and other public institutions connected with them. One of

Belgian training college for teachers.

the most remarkable of these is the great training college for teachers of primary schools at Bruges, which has been quite lately completed at a cost of some £60,000. The teachers, of whom there are some 150 undergoing training, have not merely to study and increase their own range of knowledge, but are also exercised in the art of tuition on classes of young children under the eyes of experienced professors. The ground floor of this part of the Annexe is taken up with samples of the appliances made use of in Belgian schools, such as text books, diagrams, drawings, anatomical figures, &c., and also with specimens of the work done by the pupils in every subject in which instruction is given, including needlework and the cutting out of clothes. There are also specimens of school furniture and models of gymnasia. The north end of this court is occupied by the educational exhibition of the City of Antwerp, and by the Academy of Design, and the professional schools.

Schools of the Christian Brotherhood.

The farther or Western Court contains miscellaneous exhibits. At the northern end the schools of the Christian Brotherhood show specimens of the work done by pupils. These are free industrial schools in which instruction is given to poor children, so as to fit them to become skilled workmen (see also p. 33). Close by is a remarkable electrical organ. The Kindergarten system of education for very young children is exhibited in the centre of the building. Farther on are some pieces of machinery, the most remarkable of which are used for rock-drilling in mines and tunnels. There is also a chocolate factory, and collections of preserved provisions and seeds.

Aquarium.

Returning now to the main buildings we enter the Aquarium, which was constructed and stocked with fish for last year's Exhibition at a cost of some £6,000, and in the incredibly short space of time of six weeks. The salt water for the tanks containing the sea fish, to the amount of about 65,000 gallons, was brought from Brighton, and clari-

Maignen's filters.

fied through Maignen's patent "Filtre Rapide." It is kept in a state of circulation through the tanks by means of pumps driven by Otto gas-engines, in a pumping-station at the southern end of the gallery.

The fresh-water fish are kept in tanks supplied with water which has been softened by Maignen's process, for the water supplied by the London Companies is too hard for fish to live in for any length of time. By means of this process the carbonate and sulphate of lime, which render the water hard, are thrown down, and easily removed by filtration through Maignen's large supply "Filtre Rapide." The various tanks contain many interesting specimens of fish, but probably the one which will most attract sightseers is that which contains the collection of Sea Anemones, many of which are of rare beauty. This department of the Exhibition has been handed over to the Council of the National Fish Culture Association, the President of which is the Marquis of Exeter, and the manager and secretary, W. Oldham Chambers, F.L.S. The object of the Council has been to render the Aquarium instructive as well as interesting, and consequently arrangements have been made for stocking the tanks with various species of food fishes, in addition to which there is a well-arranged establishment for the artificial culture of marine and freshwater fishes, molluscs and crustacea. The collection is further enriched by the loan of numerous cases of stuffed fishes.

IV.—MACHINERY IN MOTION—WEST GALLERIES, CORRIDORS, AND ANNEXES.

CLOTHES-MAKING MACHINERY—LAUNDRIES—SOAP MAKING—HEATING AND VENTILATION—CHOCOLATE AND SWEET MANUFACTORY—JAM MAKING—GALLOWAY'S ENGINE—COLMAN'S MUSTARD MILL—SALT WATER DISTILLERY—SODA WATER MAKING—COLD AIR MACHINERY FOR PRESERVATION OF MEAT—INCUBATOR—REFRIGERATORS—WATER SOFTENING.

Machinery in motion.

THE Machinery Department of the Exhibition is contained in three parallel buildings, the Western Arcade, which forms the continuation of the gallery containing the Aquarium, the West Gallery and the West Annexe. The first of these contains principally machines connected with the manufacture of clothing, such as sewing and knitting machines, hat and boot making plant, embroidering machines, and apparatus for the manufacture of cigars and cigarettes. There is also a remarkable handkerchief loom exhibited by Grant of Foles Hill, Coventry, the invention of George Hodson, of Leeds. Henry Heath's machinery for the manufacture of hats, and Pocock Brothers' boot-making apparatus are sure to prove attractive.

Machinery for the manufacture of clothes.

West Gallery.

Passing from the northern end of the Arcade into the West Gallery, we find ourselves in an imposing building given up to laundry appliances, machinery for the manufacture of various articles of food and drink, such as chocolate, sweetmeats, jams, mustard, and mineral waters; also soap-making and domestic appliances, such as lifts and ventilating machinery, coffee roasters, and plant for the distillation of sea-water.

T. Bradford & Co.'s Laundry.

The first objects to rivet the attention of visitors at the northern end of the gallery are the laundry appliances of Messrs. T. Bradford & Co., the same enterprising firm whose model dairy has already been noticed.

Both hand and steam machinery is exhibited, and the various processes of washing, rinsing, wringing, blueing, drying, mangling, and ironing may be seen in actual operation. Amongst the appliances which deserve special attention are the new blueing and rinsing machines, the drying closets, the disinfector, in which not only clothes, but articles of furniture, such as chairs and tables, can be disinfected by means of air raised to a temperature of from 212° Fahr. to 230° Fahr., and kept moist by means of steam; also the mangle and the large calender, or glosser machine, by means of which a whole sheet or table-cloth can be ironed, as it were, at one stroke. There are several other specimens of laundry apparatus exhibited by well-known firms, most of which will repay careful inspection.

Soap-making.

Soap-making is demonstrated by Messrs. F. S. Cleaver & Sons, and Messrs. T Harvey & Co. The processes employed by these two firms are very different. They will each prove interesting to visitors. The simplicity of the method exemplified by Messrs. T. Harvey & Co. is remarkable, no boiling being required, and the materials employed being only 98 per cent. caustic soda and fat.

Ventilating and Heating appliances.

In this part of the gallery will be found many appliances for heating and ventilating public and private buildings and workshops, &c. Amongst these may be mentioned Mr. Robert Boyle's self-acting air-pump ventilator and air warmer, ventilating stoves, and system for ventilating ships; James Howarth's air-heating, cooling, and humidifying apparatus for workshops, draughtless air inlet, for admitting fresh air with the least amount of draught, and screw ventilators for chimneys, for preventing down-draughts. The Blackman Propeller Ventilating Company, Limited, exhibit machines for moving large quantities of air, at a low pressure, with very small power, and for removing dust, steam, noxious fumes and other gases which render workshops unhealthy. The 48-inch propeller will move 35,000 cubic feet of air per minute with 2 HP. These are only a few amongst the many firms exhibiting apparatus of this description.

Lifts.

Messrs. R. Waygood & Co. exhibit several lifts, amongst them being hydraulic balanced passenger lifts, dispensing with balance-weights; chairs, and overhead sheaves; steam-power lifts, which travel up and down without attendance, at a regulated speed; hand-power lifts for warehouses, with safety apparatus to prevent the cage from falling, in case of the lifting-rope breaking; and lastly, domestic and dinner lifts. Mr. John Stone, of the Ure Mills, Ulverstone, exhibits, in another part of the gallery, a steam hoist suitable for warehouses, each floor being provided with automatic safety-shutters and doors for the prevention of accidents.

Machinery for the manufacture of food.

Machinery for the manufacture of articles of food is well represented in this Gallery. Messrs. F. Allen & Sons have a very complete exhibition, occupying a space of 50 × 20 feet, illustrating machinery and processes connected with the manufacture of chocolate and confectionery. This firm shows no less than twenty-one distinct machines, of which seven are used in the manufacture of chocolate, five in the preparation of cocoa, and seven for making lozenges and comfits. The chocolate is manufactured by placing the roasted cocoa nibs into a revolving pan, fitted with granite bottom and rollers, heated by steam, which reduces the cocoa in a few minutes into an oily paste. Sugar

F. Allen & Sons.

Chocolate manufacture.

is then added to sweeten and absorb the fluid oil, and flavour is given by means of Vanilla and other spices. The action of grinding and mixing is then continued in another machine, called the Refiner, which leaves the whole mass in the condition of a smooth paste, which is transferred to a horizontal worm working in a hopper. By means of this apparatus the paste is squeezed into a firm mass, which is ready for moulding. As chocolate solidifies at a temperature below 80° Fahr., it is necessary to keep all the machinery at about that heat. When the temperature of the air rises above 80° it is very difficult to manufacture chocolate, because it will not concrete before the fat separates from the solid matter. It is proposed to overcome this difficulty in the summer months by using Bell & Colman's Mechanical Refrigerator. Cocoa for edible purposes is divided into three classes, differing from each other mainly by the amount of oil or natural butter left with the solid portion. The processes of manufacturing these various classes is illustrated, and visitors interested in confectionery will also find much to attract their attention. For instance, there is a complete plant for the manufacture of such sweets as acid and pear drops, carraway comfits, sugared almonds, and lozenges, which are all made, packed, and sold in this part of the Exhibition. To make drops the sugar is first boiled in large pans heated by gas; it is then cooled on slabs, flavoured, and while still soft is passed in sheets through rolls, which mould it into form. The large circular pan is used for the manufacture of comfits, of which it can work about one thousand pounds weight at a time.

Sweetmeat making.

Close by is a stand occupied by the Consolidated Electric Co. This company is doing good work in electric lighting in Colchester. The exhibits consist for the most part of secondary or storage cells, fifty-four of which are said to keep eighty lamps glowing for eight hours.

Consolidated Electric Co.

Messrs. Edward Pink & Sons, who have a large case of preserves, &c., in the South Gallery, exhibit machinery for the boiling of jam, and the separation of stalks from fruit, which will be shown in operation as soon as the fruit season commences.

E. Pink & Sons' jam making machinery.

The next object of interest is the magnificent double cylinder compound engine, kindly placed by Messrs. Galloway & Sons at the disposal of the Executive Council for the purpose of driving the machinery in motion. This engine is of the horizontal type, the two cylinders being placed alongside each other, and the piston so arranged as to be simultaneously almost at the opposite ends of the stroke, a plan which ensures great steadiness of twining. The cubic contents of the cylinders are as 1 to 3, the high pressure being 14 inches, and the low pressure 24 inches diameter, the stroke of both being 30 inches. There is a link valve motion, and a powerful parabolic governor. A condensor is usually placed in rear of the engine, and is worked by the continuation of the low-pressure piston-rod. The boilers, which generate steam for the use of this engine, are in an adjoining building, the Western Annexe, and will be referred to later on.

Galloway & Sons' engine.

Adjoining the Galloway engine is the large space occupied by Messrs. J. & J. Colman, the mustard manufacturers. It contains a mill for the manufacture of mustard from the seed to flour ready for use. This firm has excavated a cellar beneath the floor of the gallery almost equal in size to the space occupied above ground.

J. & J. Colman's mustard mill.

Normandy's marine fresh water apparatus.

Close by may be seen Messrs. Beare, Gosnell & Co.'s machinery for roasting and grinding coffee, and Messrs. Normandy's marine aërated freshwater apparatus for producing good cold water from sea or other impure water, for use on land, yachts, and torpedo boats. It is stated that with the impure steam from the boilers of steam ships, 23 tons of fresh water may be obtained for every ton of coal burnt on the grates.

Galloway's soda-water machinery.

The greater part of the southern end of the West Gallery is taken up with the exhibits of the mineral water manufacturers. Messrs. James Galloway show a soda-water machine with double pumps and cylinders which will produce 60,000 bottles a day, and various smaller machines, gas generators, purifiers, and holders, and filling machines.

Barnett & Foster's Mineral waters, &c.

Messrs. Barnett & Foster exhibit a complete factory, showing the processes of manufacturing aërated waters and of bottling beers. The exhibit comprises soda-water machines, beer aërating machines, bottling and washing apparatus, filters, steam coil, syrup-making stage and sulphuric acid tank, all fixed in their respective positions, and in action; also fruit champagnes, counter fountains for iced drinks, and an English lager beer fountain, the novelty of which is, that any ordinary light English ale can be used. An iron bottle of compressed carbonic acid gas is attached by a tube to the top of the barrel, and a slight pressure put on top of the ale occasionally. This gives keeping properties, besides allowing the ale to be drawn from the fountain. The firm exhibits also many other objects of interest connected with the soda-water and bottled-beer trades.

Hayward Tyler & Co.

Messrs. Hayward Tyler & Co. also exhibit complete plant for the manufacture of all kinds of aërated waters, of the same general character as those already alluded to.

Domestic machinery.

A considerable portion of the remainder of this gallery is taken up with machinery for domestic purposes, such as meat cutting and sausage machines, refrigerators, piston freezing machines, knife-cleaners, coffee-pots, &c.

Lockhart's cocoa rooms.

Passing out of the southern end of the gallery, we enter one of Lockhart's cocoa rooms, of which there are twenty existing in the Metropolis. They have been founded to supply temperance drinks, such as tea, coffee, chocolate, and cocoa, of good quality and at low prices, on a strictly commercial basis. Light refreshments, such as scones, cakes, bread and butter, and eggs, &c., are also obtainable here.

West Annexe.

Returning now in a northerly direction, we enter the West Annexe, which, like the parallel West Gallery, is given up to machinery in motion.

Cold air machinery.

Many of the objects here exhibited are of a most important character, notably so the cold air machinery, which is exercising such an immense influence upon the food supply of this country by enabling dead meat to be imported from the Australian and New Zealand Colonies at cheap rates. Thanks to the perfection to which this class of machinery has been brought, it is now possible to obtain prime mutton from the Antipodes in the London market for 7*d.* and 8*d.* per pound. The effect of the trade which has thus been opened up can hardly fail to influence the prosperity of sheep-raising colonies such as New Zealand, and to render them even more popular in the future than they have been in the past as fields for emigration. Probably this apparently simple invention will have a more important influence on the future well-being of these colonies than anything which has occurred

since the development of steam navigation. The sphere of usefulness of cold air machines is by no means limited to the foreign dead meat trade. They are also employed for the preservation of milk, butter, fruit, vegetables, and all perishable articles of food, especially so on passenger steamers; and they are further used in connection with bacon curing, chocolate making, and other manufacturing purposes connected with the preparation of food.

J. & E. Hall's cold air machinery.

The first exhibit of this class of machinery, which the visitor will encounter on entering the Annexe on the left-hand side of the doorway, is by Messrs. J. & E. Hall. It comprises two of their smaller cold-air machines and a small chamber or store in which Australian and New Zealand mutton is kept, in order to demonstrate the practical working of the apparatus. The special features of these machines are their compactness and noiseless working. They are fixed vertically for convenience' sake, but can equally well be placed horizontally. The larger of the two can deliver from 5000 to 7000 cubic feet of air per hour at a temperature of 75° below zero Fahrenheit, which is enough to preserve 85 tons of meat. The smaller one delivers 2000 feet per hour at 35° Fahrenheit below zero, and will preserve 20 tons of meat. The firm also exhibits a still smaller machine in connection with the London and Provincial Dairy in the South Gallery.

Action of cold air machinery.

The general principle on which all cold air machines act is the following. The air is compressed in holders by means of pumps driven by a steam-engine; the compression of the air generates a great deal of heat, which is abstracted by cold water circulating in tubes, similar to those of a surface-condenser, and contained in the holder. When the air has cooled down it is allowed to expand into the closed store-room; the work done in expanding absorbs all the heat left in the air, and consequently leaves it in an extremely cold condition.

Haslam Co.'s cold air machine.

On the same side, further on, the Haslam Foundry and Engineering Co., Limited, exhibit a dry-air refrigerator to discharge 18,000 cubic feet of air per hour, at 60° Fahrenheit below zero, in connection with a freezing or chilling chamber in which meat is stored.

Committee of importers of Australasian frozen mutton.

On the same side the Committee of Importers of Australasian Frozen Mutton exhibit a freezing chamber and meat store. Sir Francis Bell, Agent-General for New Zealand, is the Chairman of the Committee, and W. J. Allsupp, Esq., the Hon. Sec.

There are several other interesting exhibits in the West Annexe. Mr. Whiteley shows a van for the transit of provisions, fitted with a cold-air ventilating fan working direct from the wheels. Messrs. Lawrence & Co., Limited, show a collection of their excellent capillary refrigerators, and an apparatus for globulating fat and amalgamating the same with milk, as used in cheese manufacture and cookery. Siebe, Gorman & Co. exhibit an ice-making machine and a dry air refrigerator chamber. Christy, Thomas & Co. show a series of thermostatic incubators for the artificial hatching of eggs, a drying box for the reception of the chicks when hatched, and a rearing mother for the artificial rearing of chickens. Messrs. G. J. Blundell & Co. show a series of their pumps. There is also cask-making machinery by the London Guelph Patent Cask Company, appliances for sewage ejection on the Shone principle, and candle-making machinery by Price's Patent Candle Company, Limited.

Refrigerators.

Incubators

Galloway boilers. At the north end of the Annexe are the two fine boilers lent by Messrs. Galloway & Sons, already referred to. These are of the well-known Galloway type, the flues provided with circulating tubes; they are of steel throughout, 26 feet long and 6 feet 6 inches in diameter, and are suited for a pressure of 80 lbs. to the square inch.

Newman's old forge. The visitor has now gone through all the machinery exhibits contained in the main buildings, and there remain some objects of interest belonging to this department which are to be found in the Grounds at the north end of the West Gallery. One of the most curious of these is an old-fashioned forge, at which Mr. Newman, of Maddox Street, illustrates the forging of mediæval wrought iron-work. Passing by the pretty Ceylon and Indian coffee and tea kiosks, which are more particularly referred to on page 47, we come to Mr. George Seagrave's furnace for heating air in rapid motion, for drying purposes. The blast of cold air is driven by means of a rotating fan through a series of double, or annular tubes, both the inner and the outer tubes being exposed to the heat of the furnace. In this manner the air is heated much more rapidly than would be the case if only one surface were exposed to the action of the hot gases. Next door is a handsome pavilion put up by Messrs. Martin & Co. for the purpose of exhibiting their wood-carving produced by machinery. The centre of the terrace is occupied by a building erected by the Willesden Waterproof Paper Co., and which contains a working laundry exhibited by Messrs. Clements, Jeakes, & Co. with a drying closet in the rear. The two "Dash Wheel" washing machines, and hydro-extractors or wringing machines exhibited by this firm are worthy of notice. The next building is occupied by the Scientific Dress-Cutting Association. Mr. John Porter exhibits close by, the Porter-Clark process of softening water, by means of clear lime-water which precipitates carbonates of lime and magnesia. This system is in use on the London and North-Western Railway for softening the water for locomotive boilers. It is said to cost only a penny per thousand gallons. In the adjoining glass buildings is to be found a collection of steam-engines, machine tools and other apparatus exhibited by the Machinery and Hardware Co. The last building on the Terrace was put up by Messrs. Bradford to exhibit their apparatus for disinfecting furniture and clothes (see page 22).

Martin & Co.'s wood-carving.

Willesden paper.

Clements, Jeakes, & Co.'s laundry

Porter-Clark's water softener.

V.—WEST AND EAST QUADRANTS—CONSERVATORY AND ALBERT HALL—HISTORICAL AND MODERN DRESS—EDUCATION.

HISTORICAL DRESS COLLECTION—MILITARY UNIFORMS—FIREPROOF DRESS—GLOVE MAKING—TABLE D'HÔTE DINNERS ON WEST QUADRANT—ROYAL HORTICULTURAL SOCIETY—LIBRARY AND READING ROOM—EDUCATION—MODERN DRESS—RATIONAL DRESS—LACE—DRESS FOR SPECIAL PURPOSES.

HAVING now finished with the machinery department, we may re-enter the Exhibition buildings at the West Pavilion, which is situated at the north end of the West Arcade, separating the latter from the West

Quadrant, which leads to the great Conservatory. The Pavilion is made use of as one of Messrs. Bertram & Roberts's refreshment buffets. Passing through it, we find ourselves in the West Quadrant, which contains the Historical Dress Collection. This section of the Exhibition will prove of great interest to large classes of visitors of both sexes. One portion of it consists of a series of nineteen cases, containing wax figures dressed up to represent the costumes in vogue from the time of William the Conqueror down to the Prince Regent, a period of 750 years. Each case contains the figures of a lady and gentleman of the esquire class, and also a peasant woman and artizan of the same epoch. Reigns of sovereigns during which no remarkable change of fashion occurred have been omitted, for it may be remarked that at certain periods of our history fashions were very slow to alter, while at other times they succeeded each other with great rapidity. Each reign, for instance, from the time of Elizabeth to Charles II. was marked by a strong individuality. In the case of the working classes, the costumes sometimes remained unaltered, or nearly so, for ages. The costumes were all designed by the Hon. Lewis Wingfield, from contemporary authorities, such as missals, tombs, portraits in oil, stained glass windows, engravings, and even caricatures. In each case the authority for the costume is given in the case containing it. The dresses were all executed by Auguste & Co., the wigs by Mr. C. H. Fox, and the figures by Mr. Edwards. In many cases the old fashions were extremely beautiful, and will excite feelings of unbounded admiration, while in other instances they will appear to modern eyes to be incredibly senseless and ugly. Often and often in our history the extravagance in the design of articles of dress has been the subject of a statute or of a royal command. In some cases the shoes were worn so long in the toe that the points of the latter had to be chained up for convenience' sake to the wearer's knee, while at another epoch the sole was made so wide that a statute had to be passed limiting the width to six inches. In the sixteenth century the trunk hose worn by men was sometimes stuffed to such an extent that "over the seats in the Parliament House were certain holes, some two inches square, in the walls, in which were placed posts to uphold a scaffold round the house within, for them to sit upon who used the wearing of great breeches stuffed with hair like woolsack, which fashion being left in the eighth year of Elizabeth, the scaffold was taken down, and never since put up." Many more examples of similar follies might be quoted, and examples of some of them will be noticed in Mr. Wingfield's cases, but we of the present century cannot claim to be altogether superior to such absurdities. For instance, the hoops or crinolines worn a generation ago were as ridiculous as any fashion which we read of in past times; and it rumour is not altogether false, we have only been saved from a renewed invasion of them within the last few years by the wise veto of ladies in high places, without whose patronage no change in costume can ever ripen into fashion. Possibly in some future exhibition of historical attire, say a century or two hence, the tall hat which has for so long been the fashion for men, will be looked upon as the crowning absurdity in the collection.

West Pavilion.

Historical Dress.

In addition to the historical costumes above mentioned, there is also in this Quadrant a very interesting series of figures clothed in armour

Military costume.

and military uniform, illustrating the manner in which the British Army was attired at various periods, from the earliest times down to the present day. There are also specimens of uniforms belonging to foreign armies. The armour of the earlier periods has been lent by the War Department from the Tower. The military uniforms of the present time have been supplied from the Royal Army Clothing Depôt, by permission of the Secretary for War, and the foreign uniforms have been lent by the Governments of the various countries to which they belong. Many of the military costumes of other periods have been lent by Messrs. L. & H. Nathan, who made them under the direction of General Erskine, after researches in the Tower of London and elsewhere, while the frames of the figures have been supplied by the Royal United Service Institution, and have been completed with heads and hands by Messrs. Tussaud entirely at their own expense.

Fireproof dress.

Messrs. John Richardson & Co., of Leicester, exhibit in this part of the Exhibition a complete series of the most inflammable dress-fabrics, rendered perfectly safe by means of chemical processes. Chemically prepared starches, and the various chemicals used, will also be exhibited, and their use and effect demonstrated. The Bradford Manufacturing Co. have sent some very good specimens of dress fabrics, including their "Century" cashmeres.

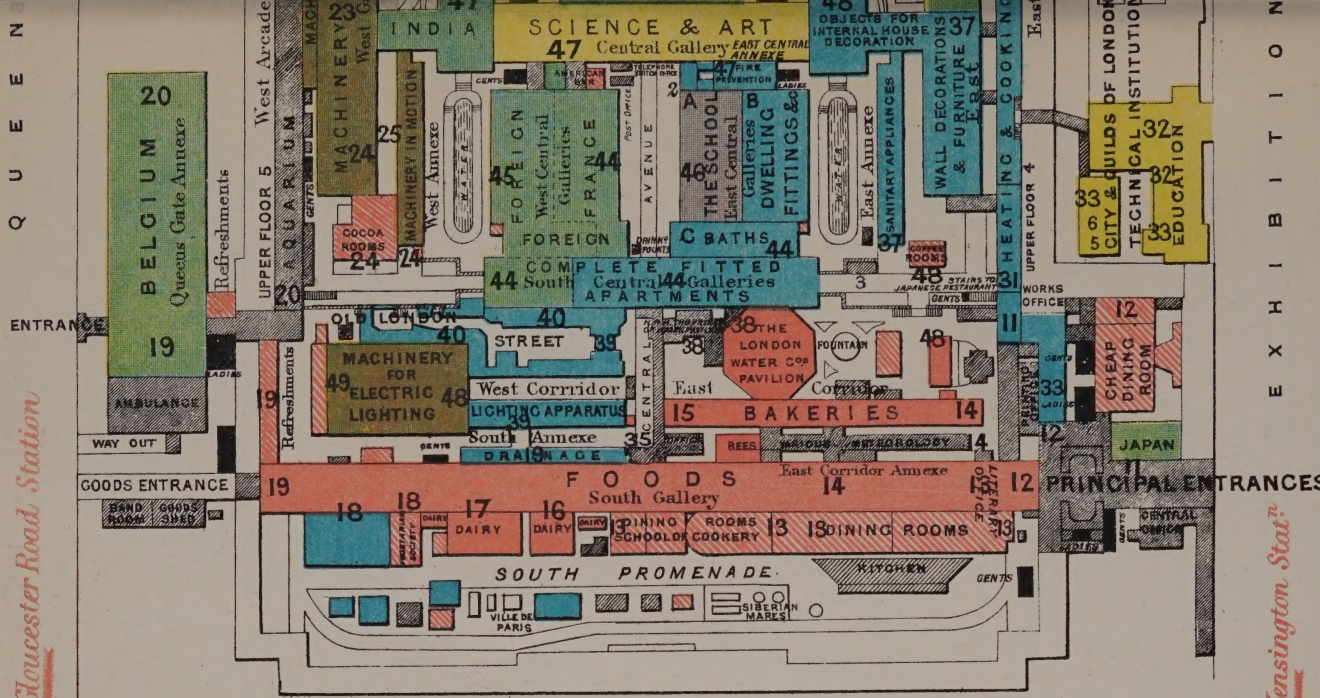
The remainder of the space in this Quadrant is occupied by hospital uniforms, the costumes worn by the Greely expedition, and plaster-casts representing various limbs and organs of the human body, deformed by the use of improper clothing, such as tightly-laced corsets and ill-fitting boots.

Glove-making by Dent & Allcroft.

Under the class of machinery and appliances for the production of articles of dress, Messrs. Dent, Allcroft, & Co. exhibit the manufacture of gloves from the skin to the finished article; those processes which the limited space will not allow are demonstrated by means of photographs. The business of this firm originated in Worcester in 1802, but the firm has now, in addition to the Worcester house, factories at Paris, Grenoble and Brussels, for kid and Suède gloves, while those of silk and taffeta are made at their establishments in London, Martock, and Torrington. Their knitted gloves come from Leicester. The raw skins come from all parts of the world, kid skins coming from Ireland, Germany, Austria, Spain, and Italy, but the finest from the French departments of Touraine, Poitou, Auvergne, Dauphiné, and the frontiers of Switzerland; those most suitable for the fashionable Suède gloves come from the Argentine Republic. Chevrette, or young goat-skins, for stouter gloves, are brought from Saxony, Bohemia, and Bavaria, while, in addition to the above, the firm uses large quantities of lamb, sheep, colt, and kangaroo skins and furs. At one stage of the operation of making gloves the leather has to be soaked in liquor made of the yolks of eggs, and it may serve to give some idea of the extent of the operations of the firm when it is stated that they use annually for this purpose some three million eggs. More than four millions of kids and lambs are slaughtered annually to supply their wants.

Table d'hôte dinners on West Quadrant.

On the flat roof of the West Quadrant is a glass conservatory, which has been fitted up and utilised by Messrs. Bertram & Roberts as a large dining-saloon, in which is served a first-class club dinner from 6 P.M. This dining-saloon has windows prettily curtained in the French manner,

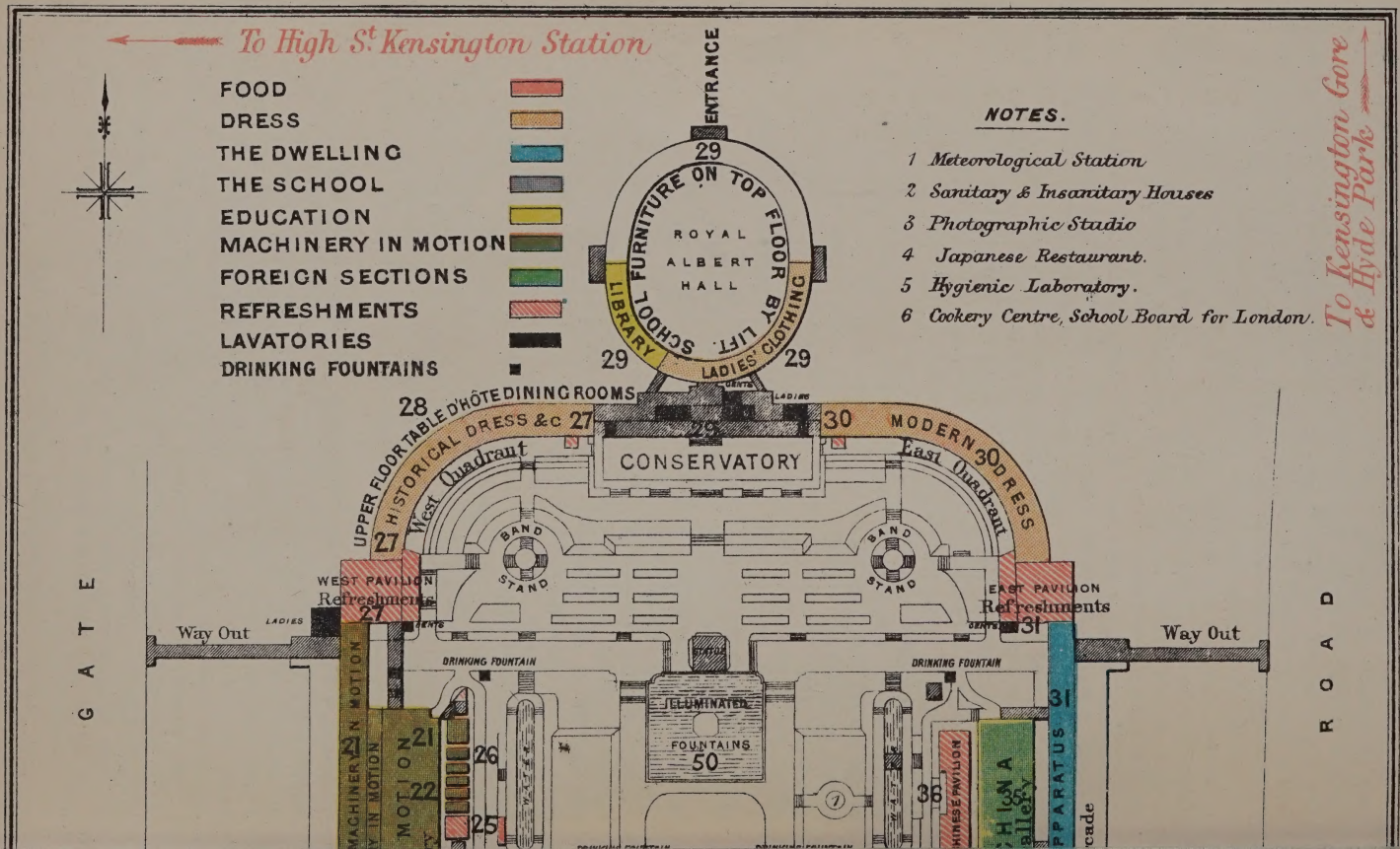


GENERAL PLAN

INTERNATIONAL HEALTH EXHIBITION, LONDON, 1884.

Wm Clowes & Sons Limited, Litho. Duke St Stamford St S.E.

Wilson Bennison, Surveyor to the Executive Council.


To High St Kensington Station
FOOD
DRESS
THE DWELLING
THE SCHOOL
EDUCATION
MACHINERY IN MOTION
FOREIGN SECTIONS
REFRESHMENTS
LAVATORIES
DRINKING FOUNTAINS
ENTRANCE
29
ROYAL ALBERT HALL
FURNITURE ON TOP FLOOR BY LIFT.
SCHOOL LIBRARY
LADIES' CLOTHING
29
29
NOTES.
1 Meteorological Station
2 Sanitary & Insanitary Houses
3 Photographic Studio
4 Japanese Restaurant.
5 Hygienic Laboratory.
6 Cookery Centre, School Board for London.
To Kensington Gore & Hyde Park
28 TABLE D'HÔTE DINING ROOMS
UPPER FLOOR
HISTORICAL DRESS &c 27
West Quadrant
29
CONSERVATORY
30 MODERN DRESS
East Quadrant
27
BAND STAND
BAND STAND
WEST PAVILION
Refreshments
27
EAST PAVILION
Refreshments
31
LADIES
GENTS
Way Out
Way Out
GATE
ROAD
DRINKING FOUNTAIN
DRINKING FOUNTAIN
ILLUMINATED FOUNTAINS
50
MACHINERY IN MOTION
21
MOTOR
22
21
26
25
36
CHINESE PAVILION
35
CHINA
Gallery
31
APPARATUS
Arcade

from which the guests are able to look down upon the illuminated gardens beneath, and whence they are able to hear the music of the Military Bands. This dining-room, thus admirably situated, forms one of the most agreeable of the social features of the Exhibition.

Royal Horticultural Society.

On passing out of the Quadrant, the visitor enters the Great Conservatory, which is beautifully decorated with rare plants, ferns and palms by the Royal Horticultural Society, and in which the Society's Shows will be held at intervals throughout the season. No less than twelve fruit, vegetable, and flower-shows will be held between the opening of the Exhibition and the 30th of October, occupying seventeen days. At these, money prizes of considerable aggregate value will be distributed.

Lace.

Amongst the more artistic objects relating to dress we may refer to the collection of Buckinghamshire lace exhibited by the President of the Executive Council, the Duke of Buckingham and Chandos, in the Conservatory; and to the specimens of ancient and modern Honiton lace contributed by Messrs. Marshall & Snelgrove. The art of making this description of lace was first introduced into Devonshire by certain Flemish refugees who escaped from the religious persecutions of the sixteenth century in their own country. Since that time the making of lace has given work to many thousands of women and children. In the year 1851 from 7000 to 8000 were so employed; but to such an extent has this artistic industry declined that at the present day it does not occupy more than from 300 to 400 hands. Mrs. F. Hubel sends an excellent collection of all kinds of Irish lace.

From the Conservatory we can gain access by means of the central flight of steps to the lower galleries in the Albert Hall.

Library and Reading-room.

That on the western side is given up to the Library and Reading-room, which has been specially organised for this Exhibition. The Executive Council have invited authors, publishers, and others to send copies of works on subjects embraced in either of the two divisions of the Exhibition. Books to the number of about six thousand have been received, which have been classified and catalogued, and are available, together with the daily papers, for use by the public visiting the Exhibition. The catalogue has been printed, price 6*d.*, and the reading-room is open each day between the hours of 11 A.M. and 6 P.M.

Ladies' and children's underclothing.

The Eastern Side-Gallery contains a collection of ladies' and children's underclothing, designed specially with reference to hygienic considerations. Naturally, improved corsets of numerous patterns form a large feature in this Exhibition. There are also some comparatively novel and very beautiful materials, such as crape and net for underclothing, silk longcloth, and a pine-wool fabric, which is said to protect the body against rheumatism.

Educational exhibition.

The Upper Gallery of the Albert Hall, which is reached by a lift, forms part of the Educational Exhibition. In it are shown specimens of school furniture and fittings, diagrams, pictures, maps, and mechanical drawings, models, and other appliances used in teaching, as well as educational games and books. The sections into which the educational group is divided are six in number. The first relates to crêches and infant schools, including the Kindergarten, that most admirable method of teaching young children, first thought of by Johann Pestalozzi, and developed by Froebel. In this system the teaching more re-

Kindergarten.

sembles play than work, the children being instructed by games, having an educational basis, in such a manner, that they acquire almost imperceptibly the rudiments of knowledge.

Domestic economy for girls.

The second section relates to Primary Schools; the third to Domestic Economy and other forms of Technical and Industrial Education for girls, and includes models and apparatus for the teaching of cookery, housework, washing, needlework and dressmaking, painting, &c. The Demonstration frames and diagrams for the teaching of needlework to large numbers of girls simultaneously, exhibited by Messrs. Griffith and Farran, is an interesting feature in this section of the Exhibition.

Science teaching.

The fourth section has to do with Science Teaching, and includes models and apparatus used in instruction in chemistry, the physical sciences, mechanics, physiology, anatomy, astronomy, &c. Several of the collections are specially intended to illustrate well-known scientific text-books, such as Tyndall's 'Lessons in Electricity,' and Dr. Geikie's 'Science Primer of Geology.'

The two remaining sections deal with Art Teaching, and schools for the Blind, and the Deaf and Dumb. The exhibits relating to the former of these two classes are by no means so numerous and representative as are those which deal with the other divisions. The collection dealing with Deaf and Dumb Schools is for the most part exhibited in the City and Guilds of London Institute.

East Quadrant.

The visitor on descending from the Upper Gallery must again find his way into the Conservatory, whence he can pass into the Eastern Quadrant, which contains the collection of modern attire.

Modern dress.

Here will be found numerous examples of every conceivable article of clothing required for the human body from the head to the feet, as well as complete costumes for special purposes, such as sporting, touring, and cycling, diving, and life-saving.

Boots and shoes occupy a considerable portion of the Quadrant; unfortunately, however, the more hygienic the reputed qualities of the boot, the less does its form commend itself to the artistic taste. There are several specimens of the costume of the future.

Rational Dress Society.

The Rational Dress Society, under the presidency of Viscountess Harberton, sends several varieties of outdoor and evening dresses with divided skirts for ladies and children, and also Mrs. Bishop's Rocky Mountain travelling costume. Hamilton & Co. send a divided dress for athletics and ordinary wear, said to be indistinguishable from ordinary skirts. As a rule the innovators in ladies' costume appeal more to the reason than to the artistic sense of those whom they seek to convert to their views, while at the same time they tax the courage and traditional prejudices of the fair sex to an extent that will probably place insuperable difficulties in the way of their efforts. Possibly, if the artistic side of the question were kept more in view the difficulties now experienced by dress reformers would to a great extent vanish.

Lady Brassey.

Lady Brassey exhibits in this part of the gallery a case containing specimens of articles of clothing collected in different parts of the world. Many of the objects exhibited are of great beauty, and the collection is altogether one of great interest.

Farmer & Rogers.

Messrs. Farmer & Rogers exhibit some interesting Japanese figures in national costume, and also a collection of Oriental embroidered robes and shawls, many of which are of rare beauty.

Men's hats of every description are shown in all stages of manufacture by Messrs. Lincoln & Bennett, and by Henry Heath, who also exhibits in the West Arcade the collection of hat-making machinery. Some of the well-known houses have filled cases with modern costumes and dress materials. **Hats.**

In the section devoted to waterproof clothing many of the best firms exhibit samples of garments for ordinary and for special purposes in our own and in foreign climates, and also appliances for camping out, and for the use of invalids. **Waterproof clothing.**

The class relating to dress for extreme climates contains principally examples of furs and fur clothing, and a few samples of helmets and other head-gear suited for wear in tropical climates. **Dress for extreme climates.**

There are several exhibits in the division relating to dress for sport, &c. Amongst the most novel of these are the cycling costumes for ladies, sent by Mr. J. T. Goodman, and the samples of hygienic and hygroscopic cloth manufactured to produce a sufficient amount of warmth with the least weight, and possessing special facilities for the absorption of perspiration, exhibited by Messrs. Howell, James & Co., Limited. Messrs. Benjamin & Co. also send specimens of their well-known goods; and Mrs. H. F. Baxter exhibits a lady's costume for the Highlands. Attention may well be devoted to the woollen clothing of every description, including bedding and bedclothes, invented by Dr. Jaeger, and also to his explanatory pamphlets. **Dress for sport.**

In the important section devoted to life-saving dress the most interesting exhibits are the cork appliances worn by the life-boat men, exhibited by Messrs. J. & A. W. Birt, and the Fleuss diving-dress and breathing-dress for working in noxious gases, exhibited by Messrs. Siebe, Gorman, & Co. By means of this latter apparatus a diver can inhale his own breath over and over again without injury, for each exhalation is filtered through caustic soda, which deprives the vitiated air of its carbon. **Life-saving dress.** **Fleuss's diving dress.**

VI.—EAST ARCADE—EAST GALLERY—EAST ANNEXE.

REFRESHMENTS—HEATING AND COOKING APPARATUS—CITY AND GUILDS OF LONDON INSTITUTE—COALBROOKDALE CO.—CHINESE EXHIBITION AND TEA GARDEN—WALL DECORATIONS AND FURNITURE—SANITARY APPLIANCES.

At the south end of the East Quadrant there is another Refreshment Bar of Messrs. Bertram & Roberts, and opening out of it is a large covered space in the gardens, in close proximity to the Band Stand, where the public can be served with light refreshments while enjoying the music. Beyond this refreshment-room, in the East Arcade, the visitor will find an immense collection of heating stoves, cooking ranges, smoke-consuming grates, and similar objects, reaching almost to the Principal Entrance, whence he is supposed to have started on his tour. It would be impossible, within the limits of a small guide, to refer in detail to the numerous exhibits contained in this building, but the visitor who is interested in neat and economical kitchen ranges, in cooking and heating by gas, in the use of anthracite coal, and in **Refreshment bar.** **East Arcade.** **Heating and cooking apparatus.**

the problem of smoke consumption generally, will find enough here to occupy his attention profitably for a considerable time, and will doubtless be able to obtain all needful information from the circulars distributed by the agents of the various exhibitors.

City and Guilds of London Institute.

About the middle of the Arcade is the entrance to the building belonging to the City and Guilds of London Institute, which contains the remainder of the Educational Exhibition, the various classes of which have been already described in reference to the Upper Gallery of the Albert Hall. (See also p. 34.)

Kindergarten.

Amongst the collections most worthy of note in this building, is the Kindergarten Exhibition, contributed by the British and Foreign School Society. Demonstrations will be given every week in the lessons and games taught at these Institutions, and it is hoped that it will have the effect of giving to parents and the teachers of elementary public schools, new and more complete ideas of what the education of very young children implies. This collection is to be found on the second floor, Room No. 12.

Committee of the Manchester Art Museum.

In the corridor of the second-floor is the Exhibition of the Committee of the Manchester Art Museum. The Committee consider that whereas the subject of technical education is now receiving much attention, the subject of artistic education during childhood is much neglected, that the majority of the children of the working-classes pass their lives in places where beauty is unknown, and that consequently they lack the qualities needed by good designers, viz., a keen sense of beauty of colour and form, which can only be acquired in early childhood. They further consider that by means of a small art gallery in every crowded town district, and by means of small collections lent to the elementary day and Sunday schools in the district, much elementary knowledge and appreciation of art may be acquired. The collection contains samples of the kind of pictures which the Committee lend to schools. It is intended in the future to add other artistic objects, such as pottery, casts of sculpture, textile fabrics, &c.

Designs for carriages.

The second-floor corridor contains also a number of designs for carriages contributed by the Coachmakers' Company of the City of London, the Institute of British Carriage Manufacturers, the St. Mark's Technical and Drawing Classes for Coach Artisans, and others, which illustrate the progress of technical education applied to the carriage building trades.

Mr. Robins exhibits in this part of the building, drawings of some of the fittings required for applied science, and educational buildings, and the engineering department of University College, London, shows drawings and photographs of the buildings of the engineering laboratory, and of some of the machines and appliances which it contains.

Technical training for trades.

Room 14 contains several collections relating to technical education contributed by the Sheffield School Board, Mr. James Rigg, Messrs. Gilkes, Gilbert & Co., Mr. John Channon, and others. The School of Art Wood Carving sends a number of specimens of carved panels, pilasters, cabinets, and mouldings, designed and executed by students of the school. The Instructors of the trades classes at the Technical College, Finsbury, exhibit a number of models relating to the joinery, metal-plate, bricklaying and boot-making trades. The remaining rooms in this part of the building

contain many collections of apparatus and examples used for teaching the blind, the deaf, and the dumb, contributed by many of the best known schools and institutions. **Schools for the Deaf and Dumb.**

Room 15 contains the Biological Laboratory which is open for inspection daily, and is under the direction of Mr. Watson Cheyne. In this laboratory are shown the minutest forms of plant life, especially those associated with disease, their life, history, and the methods of investigating them. There is a demonstration every Thursday at 4 P.M. **Biological Laboratory.**

The first-floor is given up to the French Government, the National Society, and the Institut des Frères des Ecoles Chrétiennes. This latter society occupies Room 5. It was founded in France in the year 1680, by J. De La Salle. At the present moment it consists of 11,233 members, having 1,175 houses, and 328,800 pupils in most of the principal countries in the world. **Institut des Frères des Écoles Chrétiennes.**

This society, on account of the important work which it carries out, and the great influence which it exercises in the technical training of workmen, agriculturists, &c., deserves more than a passing notice. The member of the society in charge of the collection, Brother Noah, Professor of Method in New York, spares no pains in enlightening visitors as to the system pursued, and the work done by the society.

Before entering Room 5, attention should be paid to the map of the Society of the Brothers of the Christian Schools. The size of the dark spots on this map indicates the relative importance of the establishments throughout the world. Beneath, are sections of school museums explaining or illustrating the processes of printing, electrotyping, stereotyping, gilding, &c.

Here again are the rough drafts of plans and sketches of memorable buildings, taken in the grounds by pupils under seventeen, with the detailed and finished work beside. Entering the room, we find an explanation of the system of geography, from the lesson on how to read a map, and how to build up a county, commencing with the schoolhouse, to maps traced from memory, the age of pupil being given, and also the time taken in doing the work.

A museum from Marseilles, giving the imports, with map tracings, showing course of vessels in procuring these articles, will be of great interest, as co-ordination of history, drawing, geography, and kindred subjects is here shown.

A very complete collection of minerals, raw and manufactured articles from Savoy and elsewhere, with specimens of silk work from Lyons, done by boys from fourteen to eighteen years of age, with technical instruction given in connection with mechanical and manual work prove interesting to most visitors.

The thousands of copies of home and school work shown, should be carefully studied, and the constant desire of the exhibitors in this room is, that visitors should examine and prove for themselves.

The main aisle is devoted to mechanical, architectural, and ornamental drawing. Here will be found specimens of sketches taken in factories from the machines, the same being freely developed in copies shown to the visitors. This is the system pursued in all parts of the world by professors of drawing connected with this brotherhood—reproductions from the cast and from wooden designs deserve special attention. Most visitors are specially impressed by the wood-carving,

tracing in wood and stone, mathematical and other scientific instruments shown as the work of boys between fourteen and eighteen years of age, from the School of St. Nicholas, Paris.

Opposite are specimens of school work from the schools of America; New York, Philadelphia, Baltimore, Quebec, and Montreal, predominating. Memphis, Tenn., shows an interesting museum of the cotton plant in its various stages, with articles made, and extracts taken from the plant.

The shorthand or stenographic papers from Providence, R.I., call for special remarks, being a reproduction of a judge's charge to a jury, the boys having taken from 167 to 210 words per minute, which fact is certified to by the judge, a notary public, and the resident vice-consul.

The work of the N.Y.C. Protecting Society appeals to all philanthropists, being the result of the efforts to reclaim the little waifs of New York City. These specimens of work are really startling, and go to show what may be done with the least favoured classes.

The Model School of Beauvais, where agriculture is made a speciality, completes this hurried sketch. There are shown the different kinds of wheat, large numbers of species of corn, beans, peas, &c., with the reports made by students visiting neighbouring farms and industrial centres within a radius of at least 10 leagues, while a series of experiments in the treatment of disease in plants and cereals fittingly complete the exhibit. All information is freely and gladly given by the gentleman in charge.

National Society.

The next room is occupied by the National Society, which was founded in 1811 for "the promotion of the education of the poor in the principles of Established Church." There are at the present time 11,703 Church schools in the country, the average daily attendance being 1,562,507 pupils. Since the year of the foundation of the Society the voluntary expenditure on Church schools has been over twenty-eight millions sterling, and during the last fourteen years the expenditure has been nearly a million a year.

Rooms 7, 8, 9, and the Corridor, are occupied by part of the French Educational Exhibition, the remainder of which is to be found in the French portion of the West Central Gallery. It comprises a very large and important collection in all the sections of this group (see pages 44 and 45). Of special interest are the displays illustrating superior primary schools for technical instruction and design, and the training college for teachers of the manual arts contained in room 8. The corridor on this floor contains an excellent collection of anatomical and botanical models. Room 9 relates chiefly to professional schools for girls.

School Boards of London, Birmingham, Edinburgh, and Glasgow.

The Ground Floor is occupied for the most part with the collections of the School Boards for London, Birmingham, Edinburgh, and Glasgow, but one of the rooms is given up to the Society for Training Teachers for the Deaf. These important collections contain exhibits relating to the school accommodation, buildings, and furniture; the subjects taught including text-books and apparatus; miscellaneous subjects such as maps, diagrams, pictures, rewards, and certificates; and lastly the industrial schools. In the large workshops in the basement are to be found several examples of lathes, and machine and hand tools.

On leaving the building, a passage will be found on the left-hand side

leading to an iron building, which contains the exhibits of the Foreign Technical Schools, the Central Cookery Establishment of the London School Board, and the Hygienic Laboratory.

This latter is under the direction of Professor Corfield, and is open for inspection daily. It is designed to show the arrangements suitable for the examination, from a public health point of view, of water, air, food, and drinks. **Hygienic Laboratory.**

It must be acknowledged that the treatment of the subject of education, as exemplified in this building and in the French and Belgian Courts and the Albert Hall, is most exhaustive and instructive. The spacious and handsome building was, as its name implies, erected by the City and the Guilds of London as a high school for technical education It will supply a much needed want in the Metropolis. It has lately been opened by H.R.H. The Prince of Wales, and will be ready for educational purposes by the beginning of the October term. The course of instruction to be given at this Institution is intended to qualify students to become: 1. Technical Teachers; 2. Civil, Mechanical and Electrical Engineers, Architects, Builders, and decorative artists; 3. Principals and Managers of Chemical and Manufacturing works. The course of study will differ from that to be obtained at the Universities principally in this respect, that, at the old seats of learning, science is taught in the abstract, whereas at this Institution it will be taught principally in its industrial applications.

At the extreme southern end of the East Arcade, in the corridor connecting the latter with the Entrance Hall, is part of the exhibition of the Coalbrookdale Company, which in its entirety comprises improved grates, pavilion gates, covered way in house erected for the Wolverhampton Electric Light Company by Mr. Taylor Smith; fireplaces and overmantels in cast-iron, drinking fountains, and works executed from designs by students of the Science and Art Department. These, however, are not all to be found in this portion of the Exhibition, but are distributed in different buildings. The exquisite character of the cast-iron work used in the grates and overmantels should be carefully noticed, this class of work being a specialty of the firm. This company has also contributed, in no small degree, to the beautifying of the Water Companies' Pavilion and the grounds, having lent two large fountains, the vases, and some hundreds of their cast- and wrought-iron seats. **Coalbrookdale Co.**

There are several doorways leading from the Arcade containing the stoves into the East Gallery, and the visitor will do well to inspect this portion of the buildings next. The northern half is reserved for China, and the collection contributed by this country will be found to be one of the most interesting features in the entire Exhibition. The walls and roof of the Court are beautifully coloured by Chinese artists, and are hung with Chinese lanterns containing electric lights, with ornamental kites and coloured flags; the walls are richly decorated with porcelain plates, educational pictures, and specimens of old arms and armour, conspicuous amongst the latter being the striped black and yellow tiger clothing of the old soldiery. The writings of many of the symbols on the walls were executed by the Chinese Ambassador the Marquis Tseng, who is famed for his skill in caligraphy. The Court is entered from the Southern end by a screen or Pailow, such as is used in China as the **East gallery. Chinese Exhibition.**

entrance to a street. On either side of the central passage are shops, the two on the right are from Pekin and Kienkiang, and those on the left from Canton and Hankow. The beautiful carved fronts, which are exact reproductions of those in actual use in the cities named, should be carefully noted. The shops are filled with porcelain vases, plates, dishes, curious pipes and other articles, brought over to this country by Chinese merchants. Farther on, the visitor will find on his right hand a bedroom with two beds beautifully curtained, one for summer, the other for winter use, together with a complete set of bedroom furniture. On the left-hand side are the magnificent appointments of a *salon*, consisting for the most part of ebony and marble couches, chairs and tables, reversible stools, the side for summer use being of straw, that for winter of a warm material. The carpet, which is most beautiful, is also of Chinese manufacture, as are the metal charcoal hand and foot warmers.

Close by, on the right-hand side, is a case of Chinese ladies' boots, the absurdly small size of which affords one more proof of the ridiculous results which may be produced by fashion. On the opposite side are some cases of beautiful soapstone ornaments. The wall-cases beyond these contain a collection of Chinese books, many of them being of an educational character; there is also a series of rubbings from old tablets, some of which are two thousand years old. The Chinese are famous for their study of literature; they were the original inventors of competitive examinations. Lately they have taken to the study of modern sciences, and many of the books exhibited are translations of European text books. The wall-cases round the Northern end of the Court are filled with wax figures, draped to illustrate the summer and winter clothing of various ranks in Chinese society. There are over thirty of these figures fully clothed, not merely with the outer garments, but with complete underclothing in addition. Many of the figured silks and embroideries are of very beautiful design and work, and are worthy of the closest attention. The floor of the North end of the Court is occupied on the one side by a gorgeous bridal palankeen, and on the other by a catafalque covered with exquisite embroidery. The palankeen is represented with its bearers. There is also a Pekin cart with a figure of its driver; the harness and metal-work are of very fine workmanship.

Flanking the Chinese Court, and looking out on to the Grounds, is a handsomely-decorated Chinese restaurant and tea-room, which was erected by Messrs. Holland. It is surrounded by a spacious verandah, and contains a dining-saloon with balcony, a tea-room, and kitchens. According to the Chinese theory when a man goes to a restaurant he ought to feel cheerful, sociable, and happy; and on the other hand, he goes to a tea-room to reflect, or to indulge in sober and earnest conversation. Accordingly we find the decorations of the two rooms reflect these ideas. The dining-room is very gay, full of light and colour, and the tea-room is relatively sombre. The artificial flowers used in the decoration of the frieze are made of pith, and come from Amoy. The wall decorations represent vines and other creepers, and the door leading out to the terrace is a fine piece of carving, executed by a Chinest artist named Teh-ah-Kene, at present residing in this country. The restaurant and tea-room are only to be approached through turnstiles. The charge for admission to the dining-room, which includes the price of dinner, is

seven and sixpence, and that to the tea-room, which includes a cup of tea and biscuits, or an ice, is one shilling. The dishes are, of course, perfectly novel to untravelled Europeans; amongst them are to be found the celebrated bird's-nest soup, which is said to be delicious, white-shark's fins, and a dish made of the *beche de mer*, or sea-slug, which is said to resemble the green fat of turtle. The dinner includes Chinese wine, or "Shao-sing," which is served up warm, and also Imperial tea, which is said to cost seven shillings a pound at Pekin. A Chinese band plays in the restaurant. Its music, to Western ears, is most peculiar.

Wall decorations and furniture.

The southern half of the East Gallery is given up to wall decorations and articles of furniture, tiles, non-poisonous paints, patent floorings, and similar objects. At one time the presence of arsenic in wall papers and other coloured fabrics occasioned serious complaints, and called forth loud protests from the public and from the medical profession. Now, however, many leading manufacturers are prepared to guarantee their papers to be free from arsenic and other deleterious substances. Messrs. Jeffrey & Co. have an interesting collection of hygienic wall papers printed by hand and machine, also beautiful imitation leather, flock, and lacquered gold papers. The firm has recently patented a process, by means of which all their papers are rendered washable. Several other firms have similar exhibits. The various non-poisonous paints and stains are well worthy of the attention of builders and occupiers of dwelling-houses and factories.

Jeffrey & Co.'s wall papers.

East Annexe. Sanitary appliances.

The East Annexe runs parallel with the East Gallery, and is given over to domestic sanitary appliances. It contains examples of flushing cisterns, sewer traps and ventilators, drain flushers, lavatories, and generally all those parts of a dwelling-house connected with the sewers, and through which poisoning by sewer gas is imported into improperly fitted residences. Amongst the objects worthy of notice in this Annexe is a flushing cistern exhibited by Messrs. Bowes Scott and Read, fitted with Field's beautiful self-acting annular syphons, which work with mere dribbles of water. The sanitary advantages of such flushing cisterns fitted with this arrangement can be readily appreciated. Another interesting set of exhibits is sent in by the Corporation of Manchester, and contains, amongst other things, samples of mortar, bricks, oil, candles, manure and cement manufactured from house refuse.

VII.—THE CENTRAL BUILDINGS.

HUMPHREY'S IRON BUILDINGS—LONDON WATER COMPANIES' PAVILION—PRINCE OF WALES'S PAVILION—LIGHTING APPARATUS—OLD LONDON STREET—FURNISHED APARTMENTS—FOREIGN COUNTRIES IN SOUTH AND WEST CENTRAL GALLERIES—DWELLING-HOUSE, WORKSHOP, AND SCHOOL, IN EAST CENTRAL GALLERIES—FIRE EXTINCTION—SCHOOLS OF ART COLLECTION IN CENTRAL GALLERY—INDIAN SECTION—MESSRS. DOULTON AND CO.

THE visitor who has got so far has made a complete tour of the circumferential buildings of the Exhibition, and of many of the galleries and annexes immediately adjoining them. It remains for him

now to visit the large groups of central buildings erected in the grounds. The best plan to adopt for this purpose will be to walk again to the centre of the South Gallery to the spot marked by the large beer barrel of the Tottenham Lager Beer Brewery Company, and then turn to the right, i.e. in a northerly direction, up the Central Avenue. On the right-hand side, immediately on leaving the Gallery, is the office of Mr. J. Humphreys, the builder of the Royal Pavilion, and the sole contractor and builder for the whole of the convenient iron buildings, of which there are so many scattered all over the grounds.

Humphrey's iron buildings.

A little further on the same side, and beyond the building given up to Bakeries, is the handsome pavilion of the London Waterworks, which, with its fountain, its tesselated floor, and handsomely decorated roof and walls, is one of the most striking features in the Exhibition. There are eight Metropolitan Companies, viz. :—

London Water Companies' Pavilion.

The Kent Waterworks Company.
The New River Company.
The East London Waterworks Company.
The Southwark and Vauxhall Water Company.
The West Middlesex Waterworks Company.
The Grand Junction Waterworks Company.
The Lambeth Waterworks Company.
The Chelsea Waterworks Company.

These Companies have combined to exhibit, in this pavilion, pictures showing the intakes and portions of their works, maps of the districts supplied, descriptions of the works, and specially prepared statistical tables, giving, amongst other things, particulars as to quantity, and the area under constant supply. The plan of the building is octangular, and each of the Companies has one wall to itself for the display of the above particulars. In the centre is a handsome fountain. The floors are laid in tesselated pavement, and the joists of the roof prettily decorated with aquatic plants. The roof is glazed by Messrs. Johnson Brothers on their system of imperishable dry-glazing. This system is very effective for curved roofs or domes, no bent glass being required. It is well known that it is practically impossible to keep putty-glazing water-tight in roofs in consequence of the expansion and contraction of the glass under varying temperatures. The building is surrounded by an outer corridor, in which are eight drinking-fountains, each supplied by a separate Company with water specially brought into the Exhibition for the purpose. In the outer corridor are also full-sized sections of the filtering-beds, together with models of portions of the different Companies' works, showing the methods of filtration and distribution, and a section of a street, showing the water laid on from the main to a dwelling-house. The principal entrance is in the form of an arch, made of pipes used by the Companies for the supply of water. This Exhibition has been organised and superintended by Lieut.-Col. Sir Francis Bolton as a display of the work done by the Metropolitan Companies.

Prince of Wales's Pavilion. Messrs. Gillow & Co.

Close to the Water Companies' building is the spacious and handsomely furnished Pavilion of H.R.H. the Prince of Wales, constructed by Mr. Humphreys, and decorated and furnished by Messrs. Gillow & Co. It is approached by means of a covered way, part of which is glazed without putty by Mr. J. W. Helliwell on his patent system of imperishable

glazing. It is constructed so as to be easily taken to pieces and removed. The glass is inserted in metal glazing bars, to which a metal cap is secured by means of brass-screws and nuts. The entrance-hall and adjoining alcoves are decorated in the Egyptian style, with panels of Musharabyeh woodwork, Oriental embroideries, carpets, metal work, and faience. The dining-room is of white woodwork, in the Early Style of Louis XIV. The panels are painted on gold in shades of grey and blue, and the chairs are covered in Royal Windsor tapestry. The smoking temple is in classical style, with niches and divans in colours. The adjoining room is hung with Italian Mezzari, the floors are all laid in parquet, and covered with Anglo-Persian carpets specially manufactured. Messrs. Gillow & Co. have also kindly provided the furniture and fittings in the room set apart for the accommodation of the Press. The Conservatory is decorated with a very beautiful rockery and fernery, with a dripping-well built by Messrs. Dick Radclyffe & Co. The rockery is lit up by hidden electric lamps. The floor is in mosaic marble. The same firm has erected other similar rockeries and ferneries in different places in the grounds.

Messrs. Dick Radclyffe & Co.

On the left-hand side of the Central Avenue, exactly opposite the end of the bakeries building, is the entrance to the West Corridor, set apart for lighting apparatus. The electric-lighting machinery forms the subject of a separate notice, and the remaining exhibits in this section relate principally to illumination by gas, oil, and candles. Here are shown Muller's Alpha Gas-Making Machine, Dowson's apparatus for making non-luminous gas for heating purposes, various types of gas-burners, meters, governors, and fittings, appliances for rendering explosion impossible, and methods of heating and ventilating by gas. Amongst the meters may be noted the appliances of Messrs. George Glover & Co., who exhibit dry gas-meters, standard meters for testing other meters *in situ*, and also the unit measure for gas, the cubic foot bottle, the first one of which was manufactured by this firm as a standard for the Board of Trade. In the oil and candle department are shown samples of different kinds of mineral and other oils, lamps, and candles, by several of the best known makers. The effect of gas in vitiating the air of dwelling-houses is a subject of much importance to all who study sanitary matters, and visitors will do well to give special attention to gas-burners and their governors, for it is a fact, in nine cases out of ten, that the very imperfect burners in use in houses pass considerably more gas than they burn, and thus needlessly aggravate the unavoidable vitiation of the air besides adding greatly to the gas bill.

West Corridor.

Lighting apparatus.

Returning to the Central Avenue, the next object encountered on the left-hand side, is the entrance to the Old London Street, which for picturesque beauty and interest is unsurpassed by anything in the Exhibition. It was originally intended to set up a representation of Old Cheapside as a sample not only of the domestic architecture, but also of the sanitary conditions existing in the time of our forefathers; but this design was found to be impracticable, for the reason that there exists no sufficiently accurate representation of this famous old street.

Old London Street.

The street as it has been erected at the Exhibition is formed of various authentic houses grouped together to form a quaint and picturesque thoroughfare, about the usual width of the streets of Old London

Old London Street.

as they existed before the destruction of the City by the great fire of 1666. It has been erected from the drawings, and under the superintendence of Mr. George Birch, A.R.I.B.A., from whose description the following excerpts are reprinted.

Entering from the Central Avenue, immediately in front of the pavilion of his Royal Highness the Prince of Wales, stands one of the City gates—Bishopsgate, reduced in proportion and flanked by the City wall; this gate, not one of the original gates, of which there were but four, was broken through the ancient walls, the peculiar Roman manner of building, with courses of tiles being shown on the lower part. Above the arch on each side are the arms of the City of London and the arms of the Bishopric, and immediately over the gate, in a niche, stands the statue of one of the bishops, William the Norman, to whom the City was particularly indebted, for by his good offices all those rights and privileges and immunities which the City had inherited from Roman times, and which had been confirmed and strengthened under the Saxon Kings, were reconfirmed by the Conqueror. Above, on the towers which flank the gateway, are the statues of Alfred, who wrested the City from the Danes, and of his son-in-law, Aldred Earl of Mercia, to whom he committed the government thereof.

Passing through the gate, the corresponding statue to William the Norman represents St. Erkenwald, the Fourth Bishop of London, A.D. 675, after the re-constitution of the see and re-establishment of Christianity by St. Augustine. The ground floor on each side shows on the right a debtors' prison, and on the left an ordinary lock-up, and beyond are the staircases to the first-floor. After passing through the gateway, the first house on the left is the "Rose Inn" (No. 1), Fenchurch Street, curious as having its front covered with small cut slates, instead of the ordinary lath and plaster and timber construction usual in London.

The next house (No. 2), still keeping to the left, stood in Leadenhall Street, and was known as the "Cock Tavern." The representations of this house, of which there are many, represent it after the gable had been removed, and a flat coping substituted, but in this instance its pristine condition has been reverted to. Following in order is a block of three houses (Nos. 3, 4, and 5) formerly existing in Fleet Street, towards Temple Bar, on the south side, and known by the name of the "Three Squirrels," now Messrs. Gosling's Bank.

This house (No. 6) is a copy of the one which stood at the corner of Fleet Street and Chancery Lane, and was traditionally known as the "Isaac Walton's house." But there is a doubt that tradition in this case was tradition only, as the actual house was two doors further to the west; but apart from this, the house itself was a magnificent specimen of an ordinary citizen's house in Elizabeth's reign, and was for many years a conspicuous ornament to Fleet Street, and in close contiguity to those well-known haunts of the wits of this period, the "Apollo" and the "Devil" Taverns.

Setting back a little from the main line of the street, in order to give prominence to Walton's house, and to give it the appearance of a corner house, are two unpretending wooden structures (Nos. 7 and 8), which formerly stood hard by the ancient church of St. Ethelburga, Bishopsgate Street, and were the ordinary type of hundreds of others in the old city, a shop below, and a solar or chamber above.

Standing prominently in advance of these is the old tower of a church which although not strictly modelled from that of All Hallows, Staining, differing only in having a larger traceried window, resembles in its general form and outline many others in which our forefathers were wont to worship. Most of these churches were small, for the parishes attached to them were equally diminutive, and this tower type, with bold octagonal staircase turret on one side, was almost universal. There were exceptions in which the towers had lofty pinnacles at each corner.

Next to the church, and fronting down the street, is a portion of the Middle Row (Nos. 9 and 10), which stood in the Strand, just outside Temple Bar, and was known as Butcher's Row. These houses well represent the overhanging of the stories so prevalent in London where the ground-floor space was very limited, additional room above being obtained by these means at the expense of light and air.

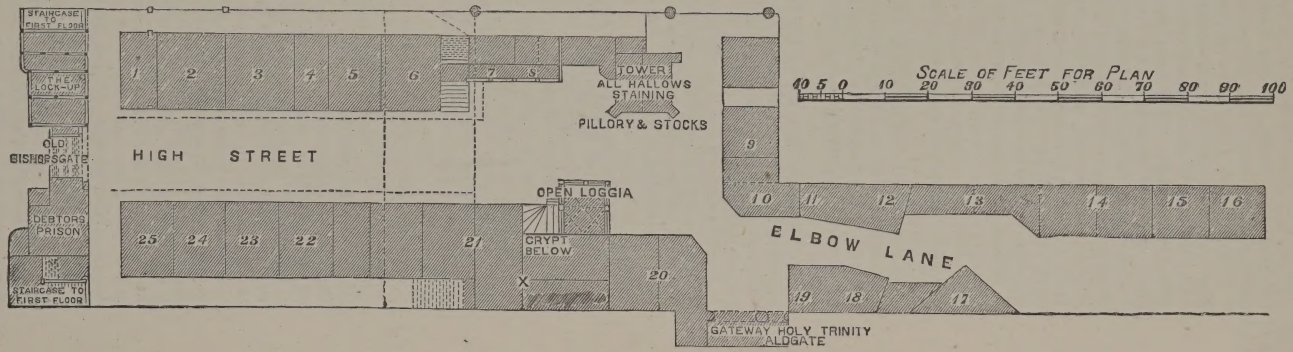
Elbow Lane.—The site at this point considerably narrows from 70 to 30 feet, and the houses are not placed parallel, in order to break a perspective which would have been too long for a picturesque effect, and also in order to obtain that sinuosity so characteristic of London streets.

Still keeping to the left, we come to a fine large house of two gables (Nos. 11

OLD LONDON.

1. Rose Inn, Fenchurch Street. Playing Card Makers' Company.
2. Leadenhall Street. Gold and Silver Wire Drawers' Company.
3. Houses S. Side Fleet St.—The Three Squirrels. Saddlers' Co. } Leather
4. Ditto. Ditto. Fan Makers' Co. } Sellers'
5. Ditto. Ditto. Patten Makers' Co. } Co. above.
6. Isaac Walton's, Fleet Street. Cutlers' Company.
7. Houses St. Ethelburga, Bishopsgate. } Goldsmiths' Co.
8. Ditto.
9. Butchers' Row.—Gunpowder Plot House. Ironmongers' Company.
10. Ditto. Blacksmiths' Co.
11. House of the "Duke of Sully," St. Clement's, Strand.
12. Ditto.
13. House from Bishopsgate Street. Printers.
14. House, Goswell Street. Joiners' Co.
15. Oliver Cromwell's, King Street. Horners' Co.
16. House, Little Tower Hill.
17. House in Little Moorfields. Glaziers' Co.
18. House at Pye Corner. Clockmakers' Co.
19. Ditto.
20. The Old Fountain in the Minories. Framework Knitters' Co.
21. Whittington's House. Royal Windsor Tapestry Looms above, Drapers' Company below, and Glass Sellers' Co.
22. House, Bankside, Southwark. } Drapers' Co.
23. Ditto. }
24. House, High Street, Borough. } Salters' Company.
25. Ditto. }

X Hall of the Guild of the Holy Trinity, Aldersgate Street. Windsor Tapestries.


STAIRCASE TO FIRST FLOOR
THE LOCK-UP
OLD BISHOPSGATE
DEBTORS PRISON
STAIRCASE TO FIRST FLOOR
HIGH STREET
1 2 3 4 5 6 7 8
TOWER OF ALL HALLOWS STAINING
PILLORY & STOCKS
OPEN LOGGIA
CRYPT BELOW
X
25 24 23 22 21 20
9 10 11 12 13 14 15 16
ELBOW LANE
19 18 17
GATEWAY HOLY TRINITY ALDGATE
SCALE OF FEET FOR PLAN
40 5 0 10 20 30 40 50 60 70 80 90 100

Old London Street.

and 12), which stood in this Middle Row, Strand, and was known as the French Ambassador's house, or the Duke of Sully's; also Monsieur Beaumont's, both ambassadors here from the Most Christian King to the Court of St. James.

The next (No. 13) is a low structure of wood and plaster, and has been modelled from an old engraving representing a portion of Bishopsgate Street.

Beyond this is an old house (No. 14) which was in Goswell Street, of the date of Elizabeth's reign. The windows are mullioned and transomed, and show one peculiarity very general in Old London, in carrying on the upper lights continuously.

Succeeding to this is a house (No. 15) which was on the south side of London Wall; the upper portion of the gable is weather boarded, and the front of the original was covered with elaborate and boldly moulded plaster decoration. It is much to be regretted that funds would not permit of having this decoration executed as in the original. London was particularly rich in this peculiar style of plaster decoration until the use of brickwork gradually superseded it.

Passing this, we next arrive at a half-timbered house (No. 16) in Sweedon's Passage, Grub Street, or, as it has been unfortunately and unnecessarily re-named, Milton Street. Only one portion of the house is given here; it possessed a curious external staircase, of wood and plaster construction; the house itself was not removed until 1805.

The two next houses (Nos. 17 and 18) are very fine specimens of timber construction, with carved barge boards. They were situated on the west side of King Street, Westminster. In the first of these, tradition allows Oliver Cromwell, as member for Huntingdon, to have lodged when in London for his parliamentary duties.

The last house (No. 19) on the left hand, decorated with medallions of the Roman emperors in plaster, stood in Little Tower Hill. There is nothing remarkable in the building, beyond that the roof line is level, and was chosen as a contrast to the all-prevailing gable.

At this point we come to the termination westward of the street, and the entrance is masked by one of the galleried fronts of an old London inn. The Oxford Arms, Warwick Lane, was chosen as a typical example; but there are still remaining in Bishopsgate Street, Holborn, and more especially the Borough, several examples of these.

Retracing our steps, the terrace wall of the Horticultural Gardens is masked by a reproduction of old London Wall, with its mediæval battlements, until we arrive at the next house (No. 20), on our left, which is set diagonally. This was on the west side of Little Moorfields, Finsbury, and was a very fine specimen of plaster work, and was not removed until the commencement of the present century. A low building connects this with two houses possessing considerable interest. They stood at the south corner of Hosier Lane, Smithfield, over against the famous "Pye Corner," where that fearful conflagration of 1666 was arrested, after having laid considerably more than three-fourths of the City in ashes. They were not removed until 1800.

Another gateway here arrests our steps. This was the entrance to the famous Priory of the Holy Trinity, Aldgate, founded by Queen Matilda, and whose prior, by virtue of his office as representing the Knighten Guild, who had made over to this priory their lands and soke, was admitted as one of the Aldermen of London of the Ward of Portsoken, who, according to custom, sat in Court, and rode in scarlet, or such livery as the other aldermen used. Beyond the gate is the inn called the "Fountain," in the Minories, which, notwithstanding its heavy projecting stories, was so strongly framed, that when it was attempted to remove it, cart-horses had to be employed to pull the beams apart. On one of them was found the date 1480.

Beyond this is the gable end of the Hall of the Brotherhood of the Holy Trinity in Aldersgate Street, near to Little Britain. This Hall has been selected as a typical example of the hall of a Guild or Livery, of which there were many within the boundaries of the ancient city. The ancient stained glass with a figure of St. Blaise, and several ancient shields which existed in 1611, have been faithfully reproduced. Allotments have been made to the following guilds for special exhibits:—Salters, Drapers, Fan Makers, Patten Makers, Cutlers, Saddlers, Leather Sellers, Gold and Silver Wire Drawers, Broderers, Pewterers, Frame Workers, Knitters, and Bowyers.

We now come to one of the most remarkable houses in this street, remarkable not only for its extreme richness of decoration, but as being connected with Sir Richard Whittington, famous in song and in story. It was situated four doors from Mark Lane in Crutched Friars, or Hart Street, up a courtyard, and was described in old leases as Whittington's Palace. Although the house from its style and orna-

mentation could not possibly have been of his time, it is possible that the front only had been ornamented and altered, for in general outline and arrangement it resembled houses of that date ; it was richly ornamented with carvings of the armorial bearings of the City Companies, which stamped it as being the house of a remarkable personage, and one whom the City had evidently delighted to honour. It was impossible to reproduce the extreme richness of its decoration—the cost would have been too great. The ornamentation has therefore only been painted, the original having been entirely carved and painted and gilt. The next two houses were situated in Bankside, and are picturesque examples of plaster decoration and open balconies. The last two houses in this street on the left before arriving at the gate at which we entered stood in the High Street, Borough ; they were only removed of late years. **Old London Street.**

The foregoing is but a brief description of the examples which have been selected to illustrate "Old London." As to actual size they have only been slightly reduced, but this has been done in proportion, although such reduction is not to a uniform scale, but has been adopted in the different cases to suit the uniformity of the plan and arrangement of the whole.

The visitor who has examined the exterior of the Old London Houses from the street, can, by ascending the staircase in the narrow part of the lane, gain access to the interiors, and pass successively from house to house, and through the first-floor of the entrance gateway to the other side of the street. In these first-floor rooms has been brought together a very good collection of old furniture, arms, tapestries, utensils, and other such objects, illustrative of the domestic lives of our ancestors. One of the most interesting rooms is decorated with the Windsor tapestry, in the production of which the late Duke of Albany took a great interest. Over the entrance gateway is a collection of pictures and maps of Old London. The first room on the south side represents a bedroom of the Rose Inn, furnished in the style of the 15th century. Further on is the collection of the Leather Sellers, which contains a variety of antique objects, amongst them being sandals worn by Roman children in London in the 2nd century; there are also leather vessels, old English gloves, and the cloak which Dr. Livingstone made for himself in Africa. Continuing on we reach a fine collection of shields exhibited by Messrs. Elkington. Lady Dorothy Nevill has contributed an interesting collection of domestic utensils made of Sussex iron. Before the application of coal to the smelting of iron, Sussex, which was then overgrown with forests, was the great iron-producing county of England. The chandeliers in this portion of the Exhibition are very interesting. Continuing round, one of the next collections of interest is the group of yew-bows lent by the Royal Company of Archers, they were used on Flodden Field, and are of the same description as those which enabled our armies in the Middle Ages to win so many victories. We next reach a beautiful collection of mediæval ironwork, and sixteen suits of armour of great rarity and value.

There are several objects of interest in the shops on the ground-floor. The first on the left-hand side has a large collection of ancient and modern, English and foreign playing-cards. In No. 2 are to be seen the saddles and harness belonging to the State coach of the Lord Mayor.

In the fourth shop are many rare specimens of old sandals, boots, and shoes, including the boots worn by Henry VIII. on the Field of Cloth of Gold. The next shop is occupied by the Fan Makers Company, who contribute many interesting and some very beautiful ancient and modern fans. Further on, at Nos. 7 and 8, is to be seen a good

collection of gold and silver and plated goods sent by Messrs. Elkington as representing the Company of Goldsmiths. The smithy, with its collection of old wrought iron work, will prove attractive to many visitors. On the opposite side of the way, at No. 19, are many excellent chime-clocks, and a model of a carillon-machine by Gillett. At No. 20 are some exceedingly interesting stocking-looms, including the first ever made in this country. In a room above, is a pair of silk hand-made stockings worn by Queen Elizabeth; they are said to be the first pair ever made in England, and are lent for exhibition by Lord Salisbury. No. 21 is occupied by the Glass Sellers Company, and 22 and 23 by the Drapers; the two end houses being taken up by the Salters.

On passing out again through the old gateway we find on our left-hand side the entrance to the South Central Gallery, which contains a series of fitted and furnished apartments and offices. The extreme western end of this gallery, on our left-hand side as we enter, is given over to Foreign Countries, whose exhibits will be referred to again, but, commencing with the apartments at this end, we find on the south side a room containing some of Mr. John Stone's moveable sound-proof partitions for dwelling houses and schools, which swivel and fold into pilasters; also sound-proof revolving shutters. On the same side Messrs. Hindley & Sons show a completely furnished apartment with wood-panelled dado, framework and ceiling, parquet floor, painted wood mantel-piece, mahogany furniture and walls hung with the beautiful washable Japanese leather paper. Next door, Messrs. Jenks & Wood show wall decorations, furniture and floor coverings for the dwelling house, and furniture and appliances for the sick room. Messrs. Jackson & Graham have a bed-room dressing-room, and bath-room fitted complete. Messrs. Collinson & Lock exhibit some beautiful plaster ceilings and wall decorations, also washable papers and furniture. Mr. Conolly has a large display of sanitary and bath-room fittings, and Mr. Constantine, close by, has a model kitchen. On the opposite side are model kitchens by Messrs. Brown & Greene, and George Kent; kitchen fittings for a club by Messrs. Benham & Sons, and a smoking room in the Oriental style with quaint Cairo woodwork fittings by Tuberville, Smith & Sons. The Town Clerk of Bath sends models of the bathing appliances of the hot mineral springs of Bath in the time of the Romans and at the present date, and beyond this are furnished apartments by Messrs. Smee and Mr. Litchfield, the latter containing some curious old oak fittings and pieces of furniture. Down the centre of the Gallery are to be found several models of sanitary houses, cottages, and industrial dwellings, and numerous examples of house fittings of various descriptions. At the extreme west end of this portion of the gallery Messrs. Salviati & Burke exhibit some of their well-known mosaic pictures and beautiful glass ware.

West Central Gallery France.

The western end of the South Central Gallery is occupied by foreign countries. Sweden and Norway, Holland, Denmark, and Venezuela here show a few cases of food products. From this part of the building access is easy to the West Central Gallery, which is given over to France and to Austria, Germany, Italy, and other foreign countries. The French exhibition occupies the eastern half of the gallery. It contains objects in nearly all the groups. Close to the main entrance

from the Central Avenue are to be found articles of clothing and specimens of wines and preserved provisions. In the portion of the gallery running north and south will be found many objects of interest relating to public hygiene, to the fitting up of schools, workshops, and industrial dwellings, and to the arrangement and construction of hospitals, dispensaries, crêches, and similar institutions. The exhibition of apparatus and instruments belonging to the Paris Municipal Laboratory, and to the Laboratory of the celebrated M. Pasteur, will be of special importance to those visitors who take an interest in scientific research. Amongst other things to be specially noted are the drawings, models, and appliances relating to the water supply, and to the sewage system of the City of Paris, contributed by the Prefecture of the Seine. Amongst the appliances for diminishing disease in workshops the most interesting exhibit is the system of blowing glass by compressed air, instead of by the pressure of the human lungs, invented by Appert Frères, of Paris. The air is forced into accumulators at a pressure of from 10 to 50 lbs. per square inch according to circumstances. When required for use the pressure is reduced by means of Pintsch's regulator to from 1 to 3 lbs. per square inch, and is delivered to the workmen in the factory through pipes. This system is not only economical, but saves the glass-blower from the danger of inflammation of the mouth and pulmonary complaints which he was subject to formerly. Messrs. Farcot & Co. show turbines and ventilators in the grounds beyond the South Gallery. There are not many specimens of furniture in the French Exhibition, but the celebrated pottery works of Gien, and also those of Choisy-le-Roi, send specimens of faience, artistic pottery, and Persian tiles. The greater part of the French Educational Exhibition is to be found in the Central Institute of the City and Guilds of London. There are a few objects relating to the Ambulance Group, such as hospital tents, appliances for transporting patients suffering from infectious diseases, and mounted ambulances, both here and in the gardens behind the South Gallery.

Japan. At the southern end of this gallery is a fine collection of Japanese bronzes and curios exhibited by Mr. A. B. Ya, and close by are some exceedingly spirited bronze castings by Woerffel of St. Petersburg. They are for the most part taken from hunting subjects. **Russia.** The Russian Ministry of Marine exhibits a large collection of naval uniforms and clothing, and there is also a fine collection of furs sent by Paul Michailovich of St. Petersburg.

Austria. The Austrian exhibits consist for the most part of specimens of food products and preserved provisions. Mr. Moser of Carlsbad sends a beautiful collection of Bohemian glass, principally cut-glass ware in gold and enamel, and Mr. G. Wahliss of Vienna has a fine show of porcelain and pottery.

Germany. Germany sends chiefly wines, beers and provisions. Messrs. Treutler and Schwartz of Berlin show some neat ventilators driven by a small turbine. One of these is stated to be able to deliver 240,000 cubic feet of air per hour with an expenditure of only a few gallons of water. Dr. Sandow exhibits some of his air filters or "preventive covers" for guarding persons suffering from pulmonary complaints from the effects of vitiated air.

Amongst the Italian exhibits the most noteworthy are some exquisitely carved cabinets and panels, and some ancient carved chests exhibited by C. Daniele of Milan. Messrs. Francati and Santa Maria of Rome send cameos and shell jewelry. The Ministry of Marine contributes a set of hospital equipments. The Ministries of the Interior, of Agriculture, and of Public Instruction are also well represented. The City of Rome has many exhibits connected with the water supply, the drainage, and the ambulance service of the city, together with several objects of antiquarian interest. There is also a good variety of wines and preserved foods.

Canada. The only exhibitor from Canada is the Canadian Pacific Railway Company, which sends a collection of agricultural products from Manitoba and the North-west, including some samples of roots and cabbages of enormous size, also publications relating to Canada, and stuffed specimens of animals and birds.

United States of America. The United States of America is represented by the San Jose Fruit Packing Company of California. The specimens of apricots, pears, plums, and other fruit, and Californian honey exhibited by this firm are excellent, and should be tasted to be appreciated.

East Central Gallery. The visitor will next cross over to the East Central Gallery, which contains exhibits relating to the dwelling house, workshop, and the school. The southern end of this building is filled with baths and their fittings, and cases of soap by various makers. Looking towards the Albert Hall the part of the building on the right is given up to materials of construction used in sanitary dwellings, such as bricks, tiles, metal work, flooring, and concrete; also roofing materials, patent stones, paints, &c. In the sanitary construction of a dwelling-house nothing is of more importance than the quality of the building materials used. Hence the contents of this gallery will repay careful study. Amongst the bricks and tiles may be noted those exhibited by Mr. J. J. Ellis of the Ellistown Collieries. Immense quantities of these bricks have lately been used in the construction of the Metropole and First Avenue Hotels.

Materials of house construction.

Ellistown Bricks.

Workshop. The central portion of the East Central Gallery is set apart to the workshop, and contains designs for improved factories; apparatus for minimising the danger to health from injurious trades, such as grinding, white lead making, &c.; illustrations of diseases and deformities caused by unwholesome trades and professions, and examples of new inventions for ameliorating the conditions of life of those who are engaged in dangerous occupations, such as coal mining. Under this latter head should be noticed the various fittings and instruments used in mines, and the compressed lime cartridges for wedging coal, now used with such good effect in many collieries as a substitute for gunpowder. The lime system is profitable as well as safe. In the well-known Shipley Collieries in Derbyshire, its use has resulted in increasing the output of marketable coal by 500 tons per acre.

The School. The portion of this gallery devoted to the School contains designs for schools of improved sanitary arrangement and construction; apparatus for warming, ventilating, and lighting schools; sanitary appliances; means for preventing the spread of infectious diseases; and apparatus for physical training, such as athletic games and gymnasia. There is an unusually fine display of gymnastic appliances. Amongst

them the Ling system of gymnastics, lately introduced into this country from Sweden, will be found very interesting. Miss Bergman gives demonstrations in its use twice a week—on Mondays and Wednesdays —with children from the Board Schools. Mr. Knopf has fine displays of gymnastic appliances, and Mr. Stempel shows some exceedingly convenient portable apparatus, which can, by moving a lever, be mounted on rollers for convenience of transport, or, by reversing the lever action, be firmly placed on the floor for use. The Lander Gymnastic Company have five machines for exercising, without undue strain, the various muscles of the body. This system is applicable to the gymnastic training of ladies and elderly people. **Gymnasia.**

At the northern end of this building is the East Central Annexe, containing apparatus for the prevention of fires, extincteurs, portable engines, and domestic fire-escapes. The great fire-engine makers do not exhibit in this department, but they have placed at the disposal of the Executive Committee many engines and other appliances for use in the buildings, if required. Amongst many excellent chemical fire extinguishers, the new Express chemical fire-engine, mounted on wheels, exhibited by James Sinclair, will be noted; and also Tyndale's smoke respirators, which enable the wearer to enter the most dense and pungent smoke with perfect safety. **Fire extinction.**

At the west end of this Annexe are two houses which should be carefully studied by every householder. One is a house, the drains, sinks, &c., of which are fitted up in the ordinary way, full of dangers to health and life, which are carefully demonstrated. The other is fitted up with improved appliances which obviate all these dangers. **Sanitary and Insanitary House.**

The great Central Gallery, running east and west, and used last year as a promenade, is devoted to a representative collection designed to illustrate the work of our Schools of Art and their influence on the art manufactures of the country. The walls are hung with a collection of framed drawings and paintings in various departments of art, prepared by the students, and comprising designs for lace, carpets, and other textile fabrics, wall papers and hangings, jewelry, glass and ceramic ware, furniture and metal work; while the body of the Gallery is filled with a number of cases containing objects manufactured by important firms from the designs of students. The collection will prove attractive to all who take an interest in the progress of industrial art, and will show that although opinions may differ as to the degree of excellence already attained by this country, nobody will dispute the fact that satisfactory progress is being continuously developed. **Central Gallery.** **Schools of Art Exhibition.**

At the western end of this gallery is the Indian Collection, and at its eastern end a fine display of art pottery by various manufacturers. **Indian section.**

The Indian section is not large, it comprises specimens of artistic metal work, textile fabrics, and some food products, as well as jewelry and furniture. The collection of Indian carpets contributed by various exhibitors is well worthy of special notice, many of the specimens exhibited being of unusual excellence. There are several specimens of Indian teas, and of the machinery used in their manufacture, which well deserve the prominence accorded to them, for the Indian tea trade is rapidly becoming a most important branch of commerce. In the Gardens adjoining are some prettily arranged pavilions, in which Indian and Ceylon tea and coffee are served to the public.

Siam. Part of the Indian Gallery is occupied by the collection recently sent from Siam, which consists for the most part of textile fabrics, some of the embroidered goods, and gold and silver cloths being of great beauty. There are also specimens of Siamese jewelry, models of houses, and domestic utensils.

Doulton & Co. The prominent object at the east end of the Central Gallery is the large pavilion of Messrs. Doulton & Co., made of the firm's well-known artistic pottery ware, with its domical roof covered with coloured tiles, and handsome columns, ballusters, friezes, and panels. The pavilion is arranged internally to show four distinct designs of fire-places with glazed mantel-pieces, hearth tiles, and fenders. There are four stands round the pavilion, the first of which is fitted up as a bath-room; the second as an exhibition of fire-places and stoves and artistic ware; the third contains filters, pumps for acids, and chemical and electrical stone ware; the fourth is given up to sanitary appliances in action, and there is also a large collection of these latter goods outside the gallery.

Joseph Cliff. Messrs. Joseph Cliff & Son have also a fine display of sanitary appliances, domestic utensils, and artistic tiles and other pottery, immediately to the rear of Messrs. Doulton's pavilion, while immediately opposite to the space occupied by this firm, is the beautiful collection of tiles, and specimens of ornamental pottery exhibited by Messrs. Wilcocks, of Burmantoft, near Leeds.

Messrs. Wilcocks.

Central Annexe. The Central Annexe to the north of the Gallery is filled with ventilating appliances.

Detached buildings. The visitor has now inspected all the principal buildings belonging to the Exhibition, but there are a few small detached buildings occupying sites in the grounds which he can inspect at his leisure. Many of these are to be found in rear of the South Gallery, between the latter building and the National Portrait Gallery. In this part of the grounds is to be found the hospital tent constructed on Lollet's system. In the grounds between the Water Company's Pavilion and the Bakeries is the building belonging to the Native Guano Company. The A B C process, for the prevention of river pollution, is explained here. Close by is an enormous centrifugal pump, and Messrs. Etzenberger's coffee-room is on the terrace adjoining. The view obtained from hence of the fountain below is very effective.

VIII.—THE ELECTRIC LIGHT—THE GARDENS AND FÊTES.

Electric lighting. NOTHING has yet been said about the lighting of the buildings and grounds by electricity, which was last year, and is again on the present occasion, one of the most attractive features of the Exhibition. Lighting by electricity moreover forms as essential a part of any health exhibition as sanitary matters, or food supply, for every other form of lighting vitiates the air of the dwelling, and consumes an undue proportion of the oxygen present, and in hot weather is apt to cause much inconvenience by raising the temperature to a degree which is often quite unbearable. From all these defects the electric light is free. The appliances for lighting the Exhibition are contained in a

separate building between the South Gallery and the Old London Street. They consist of two separate classes of machinery, viz., steam engines with their boilers, and electric machines called dynamos, the function of which latter is to convert the energy developed by the engine into electric energy. The electric current developed by the dynamos is carried all over the buildings by means of stout insulated copper cables, much as water is conveyed in pipes, and where it is required to produce a light the current is tapped from the main cables by means of smaller wires, which lead it to the electric lamp. These latter, no matter how they may differ in detail, are of two main descriptions. The first and most powerful sort is the arc lamp, in which the light is produced by the electric current leaping over the small space which separates the points of two carbon rods or pencils, one of which is consumed in the process. This description of lamp is suitable only for the illumination of large public buildings and open spaces. The second variety, called the incandescent or glow lamp, consists simply of a filament or hair of carbon enclosed in an exhausted glass bulb, and in this instance the light is produced by the electric current passing through the filament and making it white hot. In consequence of the exhaustion of the glass bulb, the carbon filament, though white hot, does not burn, and such a lamp, if fairly treated, ought to last a year.

Davey, Paxman & Co.

The steam engines used to drive the electrical machines have been lent by Messrs. Davey, Paxman & Co., of Colchester. They are six in number, and develop collectively 1250 indicated horse-power. Three of them are stationary engines of excellent design and workmanship, and are fed with steam by eight large boilers of the locomotive type, made to work at 100 lbs. pressure per square inch. The remaining three are of the semi-fixed type, and have their boilers over them. The power developed in these engines is transmitted by means of pulleys and huge leather belts to the dynamos, which have been supplied by many of the best known firms, and include examples of the Brush, Gramme, Crompton, Bürgin, Edison, Hochhausen, Elphinstone and Vincent, Ferranti, Schuckert, Siemens and other types.

Dynamos.

The following are a few of the principal displays of lighting. In the Vestibule, Council Chamber, and adjacent Dining-rooms, there are 1000 Edison incandescent lamps. In this department the fine electrolier, with coloured glass shades, by Messrs. Verity & Sons, deserves attention. The South Gallery is illuminated by 1080 Swan lamps, distributed on the woodwork of the roof, and put up by Messrs. Siemens Brothers. The Dairies are lit up by 350 Crookes' incandescent lamps. The Waterworks Pavilion has 50 incandescent lamps driven by Messrs. Crompton. The Prince of Wales's Pavilion is fitted with 200 Swan lamps. The Old London Street has in the interior of the houses 350 Gatehouse incandescent lamps, and on the outside 5 of Lea's arc lamps. The Jury Room has 40 of Wright & Mackie's incandescent lamps. The Central Avenue, and parts of the Central Galleries, are lighted up by 40 Jablochkoff lamps. The West Gallery has 40 Pilsen arc lamps. The East and West Annexes have 16 Brush arc lamps, and the Anglo-American Brush Company also light up the Vegetarian Buffet with 80 incandescent lamps. The Central Gallery is illuminated with 25 Hochhausen arc lamps, and the

East Gallery with 40 arcs by the Gülcher Company, all arranged in parallel arc. Messrs. Woodhouse and Rawson have 1,000 twenty candle lamps driven by the Ferranti machine, and distributed through the Aquarium, West Arcade, and West Quadrant Dining Rooms. Also 250 similar lamps in the East Quadrant Smoking Room, 75 in the Water Pavilion and fifty ten candle lamps in the Prince of Wales's Conservatory. The Conservatory has four 6000 candle Siemens arc lamps arranged in parallel arc. The Exhibition contains probably the largest and most diversified display of electric lighting which has ever yet been seen.

Electric lighting.

Gardens.

Illuminations.

The Gardens at the upper end of the grounds have all been carefully re-turfed and re-decorated since last year's Exhibition, and fêtes will be held in them as heretofore. The illuminations will be of an even more complete character than they were formerly, and military bands will perform every evening. The view of these gardens on a fine night with their countless small lights and Chinese lanterns is a spectacle which can be seen nowhere else in this country, and in very few Continental Capitals. Londoners can now no longer complain that they are deprived of all means of out-of-door enjoyment at night. The large fountain arranged by the Waterworks Companies at the foot of the Prince Consort's Statue is one of the special features of the evening entertainments. There are over two-hundred and fifty jets of water contrived in the most fantastic designs grouped over the surface of the fountain. The large central jets are illuminated by the beam of a powerful arc lamp with coloured slides, which enable the most varied effects to be attained, the water sometimes appearing red, at others purple, and again, when the white beam falls on it, the falling spray against the dark background of the sky resembles showers of diamonds.

Fountain.

Music.

The grounds between the Courts and all along the Central Avenue are planted with choice shrubs by many of the best known horticultural firms. At intervals throughout the afternoon and evening, the Guards' and other military bands play selections of music in the grounds, or in wet weather in the Albert Hall. In addition to the Guards' band, it has been arranged that several foreign military orchestras shall visit the Exhibition during the course of the summer. Organ recitals are given daily in the Albert Hall at 3 and 6 P.M. Favoured with fine weather, the evening entertainments in the Gardens are sure to prove one of the chief attractions of the season to Londoners.

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GUIDE TO THE SANITARY AND INSANITARY HOUSES.

ERECTED UNDER THE SUPERVISION OF A SPECIAL COMMITTEE, CONSISTING OF

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PREFACE.

WITH the view of bringing before the public examples of good sanitary arrangements, and also of some of the defects frequently found in dwelling-houses, the Special Committee have, with the sanction of the Executive Council, supervised the erection of two full-sized models of houses in the grounds of the Exhibition, one of which illustrates a house with good sanitary arrangements, and the other a house with many of the usual defects.

In the insanitary house no attempt has been made to exaggerate defects, but the object has been to represent a state of things only too common.

In erecting and fitting these typical houses, the Special Committee have received the cordial assistance of several manufacturers, whose names will be found in the accompanying list, and they are specially indebted to Mr. J. A. Roberts, who undertook the construction of the buildings.

The Special Committee wish it to be understood most distinctly, that, whilst they have of necessity selected for the purpose of illustration in the Sanitary house fittings made by particular manufacturers, they do not wish to give the idea that the fittings adopted are superior to those of similar types produced by other makers. In many cases there are several appliances equally efficient, but it is obvious that the limited space at the disposal of the Special Committee would not permit examples of all varieties of good appliances to be shown.

As the healthiness of a house depends on numerous conditions besides those of drainage and water supply, the Special Committee have endeavoured to illustrate some of

these as far as was possible, with the limited space and means at their disposal. The illustration of ventilation and warming are necessarily of a limited character.

The visitor enters the Basement of the Insanitary House, and goes up through the various floors of this house ; then, crossing by a passage to the top floor of the Sanitary House, goes down stairs to the Basement and thence out through the Area.

In consequence of the exigencies of space the rooms are only partly shown, and, in order to facilitate the circulation of the visitors through the buildings, the ordinary positions of the staircases have been changed.

These houses should be looked upon as an educational endeavour to illustrate in a practical manner many of the sanitary defects, which are so commonly found in dwelling-houses, and some of the methods by which they can be easily avoided or remedied.

LIST OF BUILDERS AND MANUFACTURERS WHO HAVE ASSISTED THE COMMITTEE BY DOING WORK OR SUPPLYING MATERIALS.

Name.	Address.	Description of work done or material supplied.
Mr. R. Adams	Great Dover Street, Boro'.	Sash fastenings.
Messrs. Bailey & Co.	Fulham Pottery, S.W.	Gully Trap. Opercular channels and siphon trap.
Messrs. Bolding & Sons	South Molton Street, W.	Bath Lavatory and fittings. Plumbers' material. Brass fittings.
Messrs. E. & C. Braby	Bangor Wharf, Belvedere Road, Lambeth, S.W.	Marble chimney-pieces and fancy tiles.
Messrs. Cliff & Sons	Wortley, Leeds	White enamelled bricks and porcelain sinks.
The Patent Liquid Fire Proof Cyanite Co.	33 Mildmay Chambers, Bishopsgate Street, Within	Fire-resisting paint for woodwork.
Messrs. Dent & Hellyer	21 Newcastle Street, Strand, W.C.	Valve Closet fitted with Tylor's Waste-preventing Valve.
Messrs. Doulton & Co.	High Street, Lambeth, S.W.	Portable tile stove. Vitrified damp-proof course.
Messrs. Faraday & Sons	Berners Street, Oxford Street, W.	Gas fittings with ventilating tubes and fixing.
Hitchin's Fire Proof Plastering Co.	1 Gresham Buildings, Basinghall St., E.C.	Fire-resisting slabs lining the walls and ceilings.
Messrs. Howard & Sons	Berners Street, Oxford Street.	Parquet Floors, Wood and Cork.
Mr. George Howe	41 Wigmore Street, Cavendish Square, W., and 29 Dartmouth Rd., Forest Hill, S.E.	Joiner's work, papering, painting and decorating.
Mr. George Jennings	Stangate, Lambeth, S.W.	Air bricks.
Messrs Kite & Co.	Chalton Street, Euston Road, N.W.	Ventilators.
Messrs. R. Laidlaw & Son	6 Little Bush Lane, E.C., Works, Alliance Foundry, Glasgow	Heavy iron socket pipe for main drain.
Messrs. T. H. Peirce & Co.	62 & 64 Weymouth Street, Portland Pl., W.	Galvanized iron dust-bin.
Messrs. Purnell & Son	Vincent Street, Westminster, S.W.	Water-waste preventers.
Mr. William Ramsey	29 Farringdon Street, E C.	Plate glass.
Mr. J. R. Roberts	Harrington Gardens, South Kensington	General structure. Plumbing and drainage work.
Messrs. Scrivener & Co.	8 Fitzroy Road, Regent's Park, N.W.	Bath and sinks. Soil pipes. Pan closets. D traps and other material.
Messrs. Shuffrey & Co.	38 Welbeck Street, Cavendish Square, W.	Wood chimney-pieces, stoves and tiles.
Messrs. Strode & Co.	48 Osnaburgh Street, N.W., and 67 St. Paul's Churchyard	Harding's air diffuser.
Mr. O. D. Ward	182 Upper Thames Street, E.C.	Water-waste preventers and grating.
Mr. Edward Wood	Red Bank Works, Manchester	Inlet and outlet ventilators.
Messrs. Woodhouse & Rawson	11 Queen Victoria Street, E.C.	Fittings for Electric Light supplied and fixed.

SANITARY AND INSANITARY HOUSES.

INSANITARY HOUSE.

Front Area.

1. Dust-bin.—*Ordinary faulty construction and position.*

On entering the front area of this house the visitor will see the dust-bin which is placed against the wall of the house, being merely a portion of the area partitioned off by a wooden framing.

This receptacle is much too large for its purpose, encouraging an accumulation of refuse.

As the wall of the house forms one of the sides of the dust-bin, it is obvious that the contents of the latter saturate the wall with filth, and so contaminate the air of the house. See the condition of the wall on the inside.

2. Bell-trap.—*Communicating directly with the Drain. Faulty form of trap.*

This trap should never be used under any circumstances. It is bad, because, 1st. Its form is such that it readily collects filth. 2nd. The small quantity of water which forms the trap soon evaporates. 3rd. When the grating is removed or the bell broken, the opening to the drain is no longer trapped.

3. Damp-proof Course.—*Composed of tarred felt, an inefficient material.*

A "Damp-proof" course, which is necessary to prevent moisture rising in the walls, is frequently altogether omitted or made of some such perishable material as tarred felt.

4. Damp.—*Arising from absence of efficient Damp-proof Course.*

The effect of using an inefficient damp-proof course is here seen in the dampness of the walls.

BASEMENT FLOOR.

5. Scullery Sink Bell-trap.—*Bad form of Trap.*

See paragraph 2.

6. Dip Trap under floor.

This is another bad form of trap—being in fact a small cesspool—it permits a large accumulation of filth, which cannot be removed by pouring water down the sink.

7. Bell-trap in floor.—*In direct communication with Drain.*

The object of this trap is to carry away the water used for washing down the scullery floor. This is not only a bad trap, as before explained, but being placed over the compartment of the dip stone trap in direct communication with the drain, allows foul air to find its way into the interior of the house.

8. Joists of floor.—*Resting on the ground; no circulation of air to prevent dry-rot.*

In addition to the injury to the structure caused by dry-rot, this arrangement is also a fruitful source of damp basements.

9. Drains.—*Stoneware Pipes jointed with Clay.*

Clay is a bad material for jointing pipes, as it is impossible to make a permanently water-tight joint with it, because it is liable to shrink and crack, and also to be washed out of the joints. Being also very compressible, it is apt to be squeezed out of the joints by the overlying weight of earth. When pipes so jointed are laid outside

the house, the roots of trees, attracted by moisture, find their way into, and gradually block up the drain.

The change of direction of the drain is effected by laying straight pipes so as to form angles instead of using curved pipes; the result is that the joints are bad, and obstructions in the drain are produced.

10. Cistern.—*Drinking-water Cistern supplying Servants' Water-Closet as well as tap over scullery sink; overflow pipe discharges directly into the Drain. Position bad, danger of leakage into the Cistern from Water-Closet over.*

No drinking-water cistern should ever directly supply a Water-Closet, because foul air from the closet may pass into the cistern. The direct connection between the overflow pipe of a cistern and a drain is a most fruitful source of evil, as it allows foul air from the drain to escape into the water-cistern and also into the house. The position of this cistern is particularly bad, although very usual, as it is immediately under the water-closet above, and any leakage from the latter will fall into it.

11. D Trap connected with Water-Closet above.—*Waste-pipe of Lavatory entering it. Bad form of trap.*

For description of this trap, see paragraph 21.

12. Overflow Pipe to Cistern.—*Connected with Drain.*

By the connection of the overflow pipe of the cistern with the drain, foul air from the drain, and often from the street sewer, is admitted into the cistern, and contaminates the drinking water, and also the air of the house. This is a fertile cause of Typhoid fever and Diphtheria.

13. Soil Pipe.—*Inside the house, of very faulty construction.*

A soil pipe should never be placed inside the house where it is possible to place it outside, because if it be faulty in its original construction, or subsequently damaged, so as to cause leakage or allow the escape of foul air, the result is much more serious than if it were placed outside.

This soil pipe is not only placed inside the house, but is made of several different materials, very imperfectly jointed, some of the joints being merely filled in with putty; such an arrangement is very liable to cause leakage. The foot of the soil pipe is connected with the drain by a right-angled junction, instead of by an easy bend; this is likely to cause an accumulation of filth in the drain.

The continuation of the drain so as to form a dead end beyond the soil pipe is also bad, because it affords a lodgment for filth, and is occasionally left unstopped.

14. Servants' Water-Closet.—*Faulty position under stairs, no light or ventilation. Faulty apparatus and insufficient water supply. Faulty connection with drain.*

No water-closet should ever be constructed without having direct light or ventilation.

The shape of the basin of this closet (known as a "Long Hopper") is bad, as it always becomes filthy; the water is admitted at one side, and flows round and round the basin in such a way that it only causes the contents of the trap to whirl round without removing them.

The cistern being only a short distance above the seat, and the pipe of small diameter, the flushing power is very inadequate. The connection with the drain is at right angles, which is a constant cause of obstruction in drains.

15. Junction.—*Improper form of Junction of the branch with the main drain.*

The right-angled junction is a bad form, because it tends to produce accumulation of filth and ultimately stoppage of the drain.

16. Drain.—*Constructed with 6-in. Stoneware Pipes with bad joints cemented on the top, but open at the bottom. Insufficient fall. No trap of any kind between the house and sewer.*

This is an example of a method of jointing pipes which is very frequently employed, to save time and trouble, not

only in scamped work, but in otherwise good work, which has not been properly supervised. To a superficial observer it produces the appearance of a properly jointed drain, but in reality it offers every facility for leakage. The result is saturation of the soil with foul matter, and contamination of the air of the house.

The insufficient fall of the drain tends to encourage the accumulation of filth, by not allowing the sewage to pass away as quickly as it should do.

The omission of a trap on the course of the drain, between the house and the main sewer, allows the entrance of sewer air into the house drain, and so, through defective sanitary arrangements, into the house.

17. Soil Pipe.—*Inside the house. Defective joints.*

The soil pipe should never be placed inside the house, when it can be avoided, for the reasons stated in paragraph No. 13.

The joints shown on this pipe are merely made with putty, instead of with solder as they should be. A joint made with putty, even if air-tight at first, will not remain so, and therefore allows the escape of foul air into the house.

Ground Floor.

18. Gas Stove.—*Without means for carrying off the products of combustion.*

The products of combustion of gas or coal should not be allowed to escape into the air of the house, as they render it unfit to breathe.

19. Soil Pipe.—*Inside house and unventilated.*

No soil pipe should ever, if it can be avoided, be allowed to pass through the interior of a house, for reasons which have been mentioned in paragraph 13.

An unventilated soil pipe causes an accumulation of foul air which escapes into the house through defective

joints in the pipe, or, if the pipe be sound, through the closet apparatus.

This foul air also frequently eats holes through the lead pipe, and so finds its way in an insidious manner into the house. These holes are often in positions where it is very difficult to find them.

20. D Trap to Water-Closet over.—*Bad form of Trap.*

This trap has several waste-pipes connected with it. For the defects of this arrangement see paragraphs 21 and 22.

21. Water-Closet.—*Bad position, without direct light or ventilation. Pan Closet and container with D Trap. Faulty form of apparatus. No "safe," danger of leakage contaminating drinking water in cistern under.*

No water-closet should ever be constructed without having direct light and ventilation.

This apparatus is known as the "Pan Closet," from its having a metal bowl or "pan," which holds a small quantity of water into which the edge of the basin dips, thus forming a sort of trap. When the closet handle is raised, the pan swings back inside an iron receptacle called the "Container," which offers a very large surface upon which the contents of the pan are splashed and to which the filth adheres. This generates foul air, which is always gradually escaping, and, when the handle of the closet is raised, is forced in considerable quantity into the house. Sometimes a hole is left in the top of the container to assist the action of the apparatus, and when this is the case the effect of pulling up the handle is to force out foul air with sufficient violence to blow out a candle.

The trap underneath this closet is of the kind known as the "D trap," so named on account of its shape. This is a very bad form of trap, because it ensures an accumulation of filth, which the amount of water passing through the apparatus cannot remove ; it is in effect a small cesspool.

There being no "safe" or tray under the apparatus, any leakage will fall into the drinking-water cistern immediately

underneath; this arrangement is very frequently to be met with.

22. Lavatory Basin.—*Waste-pipe connected with "D Trap" under closet.*

The defects of the D trap have been pointed out in the last paragraph.

By connecting the waste-pipe of the lavatory basin with the "D trap," the foul air from this trap gradually escapes into the room. The outlet from the basin is so small, that the interior of the waste-pipe is not properly cleansed.

23. Arsenical Wall Paper.

The walls are covered with papers printed with colouring matters containing Arsenic.

Particular attention is called to the fact that not only green but other colours used for printing wall papers frequently contain Arsenic.

The air of rooms which are hung with such papers becomes poisonous and frequently produces in a slow and insidious manner serious effects upon the persons inhabiting such rooms.

24. Unventilated Gas Fittings.—*Vitiation of the air.*

The ordinary method of gas fitting has been adopted. The supply pipes are of soft metal and so are easily damaged, leading to escape of gas, which is very injurious to health. The products of combustion of the gas are allowed to escape into the room, vitiating the air and rendering it unfit to breathe.

FIRST FLOOR.

25. Rain-water Pipe connected with Soil Pipe.—*Faulty joint.*

Foul air from the soil pipe and drain would escape into the house from this joint.

26. Housemaids' Sink.—*Bad position, unventilated, waste-pipe connected with D Trap of Closet.*

Sinks should always be placed in well-lighted and ventilated positions, and as a general rule against an external wall.

The objection to the connection of waste-pipes with traps of water-closets has been pointed out in paragraph 22.

27. Draw-off Tap.—*Drawing from cistern containing water contaminated by faulty water-closet apparatus.*

This tap is supplied from the cistern in roof which is in direct communication with the water-closet, and thus supplies contaminated water, which may be used for drinking.

N.B. Every tap in a house should be regarded as a tap from which water may be drawn for drinking.

28. Partition under seat of Water-closet.—*Not being plastered allows foul air to escape into adjoining room.*

In practice the partition below the seat of the water-closet being out of sight, is generally left unplastered, to save labour and material, and even if the partition is plastered, the floor-boards are partially omitted, so that the foul air circulates between the joists and ceiling below and rises into the adjoining rooms.

This is a very common defect, and a frequent cause of illness.

29. Water-Closet.—*Faulty position under stairs, no direct light or ventilation. Pan Closet with "D Trap." Faulty form of apparatus, no "safe." Leakage from closet or pipes would saturate the floor and walls below.*

See paragraph 21.

This closet is supplied by what is termed a crank and wire service, from a "service-box" in the cistern. The objection to the supply of the water-closet by means of a

crank and wire service is that, after the handle is raised, some time must elapse before the water reaches the basin, the consequence being that the handle is often let go before the water comes, and the closet is not properly flushed. Besides this, the wires get stretched by use, and so the valve is not raised sufficiently when the handle is lifted.

30. Bath.—*Faulty method of water supply, waste-pipe too small and connected with "D Trap" under Closet. "Safe" without fall, and waste-pipe connected with D Trap of Closet.*

The water is supplied to the bath through the same opening in the bottom of the bath as that which allows the waste water to run out.

This arrangement is a very usual one, and the effect of it is that some of the dirty water is always brought back again into the bath when the clean water is turned on.

On account of the small bore of the waste-pipe, the bath is very slowly emptied, which is very inconvenient, and advantage is not taken of the large quantity of water to properly flush the drains.

The "safe" or tray under the bath should fall towards the outlet, otherwise dirty water accumulates in it.

The objection to the connection of waste-pipes with traps of water-closets has been already given in paragraph 22.

31. Overflow Pipe of Bath.—*Connected with waste-pipe from bath, and this waste-pipe connected with D Trap of Closet.*

This arrangement always leaves the waste-pipe open to the room, even when the waste valve is closed, and, as the waste-pipe is in direct connection with the D trap of the water-closet, there is a constant escape of foul air into the bath-room, which very often is a bedroom, or opens directly into one.

Attic Floor.

32. Cistern.—*Inaccessible position under roof, overflow pipe connected with D Trap of Closet below.*

No cistern should be placed in a position in which it cannot easily be examined. Cisterns are generally placed in such inaccessible positions as the present one. There being no cover, dust, soot, and vermin fall into it. The overflow pipe is connected with the D trap of the water-closet, a very objectionable arrangement.

33. Service Box and Air Pipe.—*Contaminating water in cistern.*

The valve which lets the water into the pipe which supplies the water-closet, is placed on a "service box" fixed inside the cistern, and this pipe connects the service box directly with the basin of the water-closet, so that foul air passes into the service box.

To the top of this box an air pipe is attached, which is carried above the water in the cistern and then bent round. When the valve is raised by lifting the closet handle, the water rushing into the service box to supply the water-closet, forces a mixture of foul air and water out of the service box through the air pipe into the cistern, thus contaminating the water. Besides this, foul air is continually passing from the basin of the water-closet through the air pipe into the cistern.

34. Rain Water Pipe.—*Connected with Soil Pipe and emitting foul air close to window.*

This is a very dangerous though very common arrangement. It causes the escape of foul air from the soil pipe and drain (and often from the public sewer), close to the bedroom windows, through which it passes into the house.

SANITARY HOUSE.

SECOND FLOOR.

35. Deep Bead on Window Sill.—*Affording means of ventilation at the "meeting-rails" by raising lower sash.*

This is a very simple and economical method of obtaining ventilation, and can be applied to any existing sash window. When the lower sash is slightly raised, the air is admitted through the space left between the "meeting-rails," and passes into the room in an upward direction, without causing inconvenience to the occupants. By this arrangement the further advantage is obtained of being able to admit air in wet weather, as the deep beads exclude the rain.

36. Gas Bracket.—*With means of carrying off products of combustion.*

The products of combustion instead of being allowed to escape into the room, as where ordinary gas fittings are used, are carried up a tube fixed over the burner and are conducted outside the house.

37. Inlet Ventilator.—*For admission of Fresh Air.*

It is generally advisable to adopt some special arrangement for the admission of fresh air, and one simple method of doing this is by means of a vertical tube, which directs the air upwards, and thus tends to diffuse it and prevent draught.

38. Non-Arsenical Wall Paper.—*Avoiding vitiation of the air.*

See paragraph 23.

39. Cistern Room.—*Affording light and access to cisterns.*

The cisterns have been placed in a small well-lighted

room specially provided for them, immediately over the sink, lavatory, and bath, which are placed one above the other.

The cisterns are therefore perfectly accessible, and can be examined at any time by the householder without trouble.

40. Cistern supplying Bath and Flushing Cisterns for Water-Closets.—*Overflow pipe discharging into open air.*

This cistern supplies the flushing cisterns for the water-closets, but does not directly supply the water-closets themselves, an important distinction, as it determines whether the water in the main cistern can be contaminated by the closets or not.

If a cistern is directly connected with a water-closet, there is danger of the water being contaminated by the air from the closets. If, on the other hand, there is a small flushing cistern between the main cistern and the water-closet, the direct connection between these two is cut off. In the present case the cistern only supplies a bath, besides the closets, so that the question of possible contamination of the water is not of so much consequence, but it frequently occurs that it is convenient to draw drinking water from a cistern supplying closets, and then the provision of separate flushing cisterns for closets is of primary importance.

The overflow pipe passes through the wall of the house and terminates outside in the open air, serving as a warning pipe, see paragraph 82. There is consequently no connection either direct or indirect with any drain, and no possibility of the passage of any foul air passing through the overflow pipe into the cistern.

The cistern is provided with a cover to keep out dust, mice, &c.

41. Stop-cock on the Supply-pipe to Bath.—*To shut off water in case of accident.*

It is very important that there should be a stop-cock on

each of the main supply-pipes from the cistern to shut off the water in case of accident, or of repairs being required.

42. Stop-Cock on Supply-pipe to Flushing Cistern over Water-Closets.

See paragraph 41.

43. Cistern for drinking water only.—*Overflow pipe discharging into open air. Wash-out plug for cleansing cistern with pipe discharging into a rain-water head.*

This cistern supplies draw-off taps only, and has no connection, either direct or indirect, with the water-closets. This is the best arrangement where it can be adopted. The overflow pipe discharges into the open air (see paragraph 40), and in addition to this a wash-out plug is provided, fitted into a pipe discharging into a rain-water head ; an arrangement which prevents the rush of water which takes place when the cistern is emptied from flooding the yard, which it would do if treated in the same way as the overflow pipe. The cistern is also covered, see paragraph 40.

It cannot be too strongly insisted upon, that the drinking-water cistern should be kept perfectly clean. This simple precaution is in the majority of cases a better security for the purity of the drinking water than the provision of filters.

44. Stop-Cock on Supply-pipe to all draw-off Taps.

This is very important, see paragraph 41.

45. Lead Safe.—*To prevent flooding in case of accident. Waste-pipe discharging into open air.*

The safe or tray is carefully laid, so as to have a fall to its outlet. The waste-pipe is carried through the wall and terminates in the open air as a warning pipe. See paragraph 82.

46. Deep Bead on Window Sill.—*Affording means of ventilation at the meeting-rails by raising lower sash.*

See paragraph 35.

FIRST FLOOR.

47. Deep Bead on Window Sill.—*Affording means of ventilation at the meeting-rails by raising lower sash.*

See paragraph 35.

48. Bath.—*Proper method of water supply. Large-sized waste-pipe, trapped and discharging into open air.*

The water is supplied to the bath by taps delivering over the upper edge. The waste valve and pipe are of large size, thus allowing the bath to empty rapidly, which is not only very convenient, but of great advantage in flushing the drains. The waste-pipe discharges into an open head on the course of a rain-water pipe fixed outside the house, and this rain-water pipe discharges in the open air over a trapped gully. The waste-pipe is also trapped in itself immediately under the bath. This is a most important precaution, as it prevents the ingress of air through a pipe which often becomes coated in its interior with a soapy slime.

49. Lead Safe.—*With fall to Waste-pipe discharging into open air.*

The use of this safe is to prevent any leakage from the taps damaging the floor of the bath-room and the ceiling of the room below. It is essential that the waste-pipe should discharge into the open air and act as a warning pipe. See paragraph 82.

50. Parquet Floor.—*Contributing to Cleanliness.*

A floor of this kind contributes to cleanliness in several ways.

The surface being polished, does not absorb water. The joints being exceedingly close, do not allow dust to accumulate. When carpets are used, they need not cover the whole of the floor, and can be easily taken up, and the dust removed.

51. Housemaids' Sink.—*In good position, well lighted and ventilated, good form of sink. Waste-pipe trapped and discharging into open air.*

The sink is placed against an external wall with window in the room, so that ample light and ventilation may be obtained, conducing to cleanliness.

The sink is constructed of enamelled earthenware, with rounded corners ; this is a material to which dust does not readily adhere. It is left open underneath, so as to avoid providing a hiding-place for rubbish.

The waste-pipe has a siphon trap, with a cap and screw for cleaning purposes, immediately under the sink, and discharges into the open air in the same way as that of the bath ; see paragraph 48.

52. Stop-cock.—*To shut off water in case of accident.*

This stop-cock, although not essential, is very convenient, because, when the tap over the sink requires to be repaired, the water can be shut off from it, without interfering with the supply to the rest of the house.

53. Water-Closet.—*Good position. Plenty of light and ventilation. Good form of apparatus. Ample water supply from separate flushing cistern. Hinged seat to be raised when pouring down slops.*

Lead "Safe" in case of accident. The safe falls to waste-pipe, which discharges into open air.

The water-closet is placed against an outer wall, with a window affording ample direct light and ventilation ; the window is so arranged as not to overlook, or be overlooked by, the bedroom windows.

The apparatus is of a very simple and effective form, being a "Hopper" of improved shape, very different from the "Long Hopper" in the Insanitary house. The water is admitted all round the basin, by means of a flushing rim, in such a way as thoroughly to remove the contents of the basin and keep it clean. The stoneware trap under the basin is connected with the lead soil pipe by means of a joint made with Spence's metal. The use of the lead safe is described in

paragraph 49. This kind of closet is particularly suitable where the water-closet is used as a slop sink. The seat is hinged for this purpose and also to allow an easy method for examining and cleaning the safe tray, &c.

54. Separate Flushing Cistern.—*With Siphon action, cutting off direct connection with main cistern.*

This is one of a very valuable class of flushing cisterns, which not only prevent waste of water, but also ensure a proper flush to the closet. A single pull of the handle sets the apparatus in action, and, when once in action, letting go the handle will not stop it, but the flow of water continues with full force, until the flushing cistern is emptied; when the flow ceases notwithstanding that the water is still running into the flushing cistern.

The pipe between the flushing cistern and the closet is of large size (1½-inch in diameter), so that, although the cistern is only a short distance above the seat, the flushing power is very effective.

55. Stop-cock.—*To shut off water in case of accident.*

Though not essential, very convenient, for reasons similar to those explained in paragraph 52.

56. Electric Light.—*Consuming no oxygen and emitting no injurious products.*

The incandescent light in vacuo is the only artificial light which does not injuriously affect the air.

The First and Ground Floors are lighted with 18 ten-candle power, and one twenty-candle power lamps.

57. Inlet Ventilator.—*For the supply of Fresh Air.*

This is another simple method of introducing fresh air, and is called the Sheringham Ventilator. The adjustable valve gives the air an upward direction.

58. Outlet Ventilator.—*For the escape of Vitiated Air.*

In order to carry out ventilation properly, it is essential that there should be outlets for the escape of vitiated air, as

well as inlets for fresh air. The outlet ventilator here employed is a simple form. The talc flaps remain open as long as the current of air is from the room into the flue, but close if there should be a down draught in the flue tending to produce a back draught into the room. An objection to this form of ventilator is, that it occasionally makes a noise.

Ground Floor.

59. Warming Stove.—*Supplying warmed Fresh Air.*

This stove is formed of glazed stoneware, lined with fire-bricks. Fresh air is admitted from the outside into a chamber which nearly surrounds the fire-grate, and, after being moderately heated, passes into the room. The result of this arrangement is that, instead of heating the air of the room over and over again, fresh warmed air is being continuously admitted. Besides providing ventilation, an economy of fuel is thus effected.

60. Water-Closet.—*Good position. Plenty of light and ventilation. Good form of apparatus. Ample water supply, special "Intercepting cistern." Hinged seat to be raised when pouring slops into basin. Lead safe in case of accident, falling to waste-pipe which discharges into open air.*

The remarks in paragraph 53 as to position, light, and ventilation of the closet on the first floor, will refer also to this closet. The apparatus, however, is of a different and more complicated kind, consisting of what is known as a "valve closet," the distinguishing feature of which is a valve underneath the basin for the purpose of retaining water in it. This valve is moved by the handle of the closet, which also works the flushing valve situated underneath the seat. There is a trapped overflow pipe, which is flushed every time the handle is pulled up, and there is a lead siphon trap (not a D trap) underneath the box in which the valve of the basin moves. This *valve-box* is

ventilated by means of a pipe which passes through the external wall. The use of the lead safe is described in paragraph 49.

61. Special "Intercepting Cistern."—*Cutting off direct connection with the main cistern.*

The principal object of the special intercepting cistern is to cut off the direct connection between the Water-closet and the Main Cistern ; see paragraph 40.

62. Stop-cock.—*To shut off water in case of accident.*

Though not essential, is very useful, for similar reasons to those given in paragraph 52.

63. Lavatory.—*Good position, lighted and ventilated, waste-pipe trapped and discharging into open air.*

The advantages of the position are set forth in paragraph 51.

The waste-pipe is treated in the same way as the waste-pipe of the bath ; see paragraph 48.

64. Stop-cock.—*To shut off water in case of accident.*

This stop-cock, though not essential, is very useful ; see paragraph 52.

65. Inlet Ventilator.

This is another form of ventilator for the admission of fresh air, which passes through a screen of canvas by which dust is arrested.

66. Outlet Ventilator.—*For the escape of Vitiated Air.*

This is another simple form of outlet ventilator ; guide, or baffle plates, are so arranged as to offer an impediment to a down draught into the room, while not interfering with an outward current of air from the room. There is an adjustable slide by which the ventilator can be closed.

67. Deep Bead on Window Sill.—*Affording means of ventilation at the meeting-rails by raising lower sash.*

See paragraph 35.

68. Electric Light.—*Consuming no oxygen and emitting no injurious products.*

The incandescent Electric Light in vacuo is the only artificial light which does not injuriously affect the air. See paragraph 56.

69. Non-Arsenical Wall Paper.—*Avoiding vitiation of the air.*

The walls are covered with papers printed with colouring matters free from Arsenic, so that the air of the rooms is not injuriously affected.

70. Paint.—*Wood-work painted with non-poisonous paint.*

Both paint and "driers" are non-poisonous. The basis of the paint is known as "Charlton White," and is a substitute for the ordinary white lead which is poisonous. It is important to ascertain that the driers, as well as the paint, are non-poisonous, as poisonous driers are frequently used with non-poisonous paints.

71. Parquet Floor.—*Contributing to cleanliness.*

See paragraph 50.

BASEMENT FLOOR.

72. Deep Bead on Window Sill.—*Affording means of ventilation at the meeting-rails.*

See paragraph 35.

73. Walls and Ceilings.—*Covered with Washable Distemper.*

The material used for covering the walls and ceilings is known as "Duresco." It can be washed with cold water, and is a substitute for ordinary distemper which cannot be washed.

74. Stop-cock over Sink.—*To shut off water in case of accident.*

Though not essential, very useful.

See paragraph 52.

75. Scullery Sink.—*Good form of sink, waste-pipe trapped, and discharging into open air.*

This is a similar sink to that described in paragraph 51 but supported on glazed brick piers.

76. Stop-cock on Main Service-pipe to Cisterns.—*To shut off water supply from Water Company's Main.*

The object of the stop-cock on the Main Service-pipe to the cisterns is to shut off the water from the Company's Main, in case of accident, and it is very important that this stop-cock should be placed in an accessible position inside the house, and near to the entrance of the pipe into the house.

Note.—In this case the service-pipe from the Company's Main enters at the back of the house.

77. Draining Tap.—*To empty pipe in case of accident or frost.*

During frosty weather, the main service-pipe can be emptied by means of this draining tap, and so prevented from bursting.

BACK YARD.

78. Servants' Water-Closet.—*Good position. Plenty of light and ventilation. Good form of apparatus. Ample water supply from separate flushing cistern. Hinged seat to be lifted when pouring down slops. Impervious floor, in case of accident to water pipes.*

In this case the water-closet is completely cut off from the house by being out of doors, and yet has a very easy access from the house. It has a window opening into the yard, for light and ventilation ; the closet apparatus is very similar to that on the first floor, see paragraph 53. In the present case, however, there is an impervious floor, instead of a "safe," and the earthenware trap of the closet is joined directly to the drain with a Portland cement joint.

79. Separate Flushing Cistern.—*With siphon action cutting off direct connection with main cistern.*

This is another of the same valuable class of Flushing Cisterns referred to in paragraph 54, which see.

80. Stop-cock.—*To shut off water in case of accident.*

This stop-cock, though not essential, is very useful. (See paragraph 52.)

81. Rain Water Pipe.

This pipe merely takes the water from a small portion of the roof, and is therefore of smaller size than would be usually adopted. It discharges on to a trapped gully above the surface of the water.

82. Overflow Pipes.—*From Main Cisterns on Second Floor.*

Each of these pipes, which pass through the external wall, serves as a warning pipe, that is to say if any water comes out of the pipe it shows that the ball valve is out of order. The pipes project sufficiently far to prevent the water falling on the wall and making it damp.

83. Waste-Pipe.—*From Safe under Main Cisterns on Second Floor.*

This pipe projects through the external wall and acts as a warning pipe; if any water comes out of this pipe, it shows that the cistern is leaking.

84. Overflow Pipe.—*From Separate Flushing Cistern, on First Floor.*

This is another warning pipe. See paragraph 82.

85. Waste-Pipe.—*From Safe under Water-Closet, on First Floor.*

This pipe instead of being connected with the trap of the water-closet, as is usually the case, is carried through the external wall into the open air and is fitted with a brass flap, to prevent a draught coming up under the seat of the closet.

86. Waste-Pipe.—*From Housemaids' Sink on First Floor.*

This pipe discharges into an open head on the course of the rain-water pipe.

87. Waste-Pipe.—*From Bath on First Floor.*

This pipe also discharges into the open head on the course of the rain-water pipe.

88. Open Head.—*Receiving Rain Water and Waste Water from Bath and from Housemaids' Sink.*

This arrangement is preferable to a junction with the pipes, as it makes another open-air disconnection, and allows of the examination and cleansing of each pipe separately.

89. Waste-Pipe.—*From Safe under Bath on First Floor.*

This is another warning pipe. See paragraph 82.

90. Ventilating Pipe.—*To the Valve-box to Water-closet on Ground Floor.*

This pipe ventilates the valve-box of the Water-closet and at its lower end connects the overflow pipe of the Closet-basin with the valve-box.

91. and 91*a*. Overflow Pipes.—*From Separate Flushing Cisterns on Ground and Basement Floors.*

Warning pipes. See paragraph 82.

92. Rain Water Pipe.—*Also receiving Waste-pipes from Bath, Housemaids' Sink, and Lavatory.*

The waste-pipes from the bath and sink on the first floor, and from the lavatory on the ground floor, discharge into open heads on this pipe, and the pipe itself is "disconnected," from the drain by discharging with an open end into a trapped gully. It is important that the vertical pipe itself should not be connected directly with the drain, either with or without a trap, otherwise foul air may pass up it and escape at the open heads near the windows.

93. Waste-Pipe.—*From safe under Water-closet on Ground Floor.*

Another warning pipe, see paragraph 85.

94. Waste-Pipe.—*From Scullery Sink.*

This pipe, instead of being directly connected with the drain, or with a dip-stone trap under the floor (as in the insanitary house), discharges into an open trapped gully.

A "Fat-trap" is not necessary in a small house where the drainage arrangements have been properly carried out in every detail.

95. Open Trapped Gully.—*To receive Rain Water and Waste-pipes.*

This is a good form of trap for receiving waste water from sinks, baths, &c. It is a glazed stoneware gully, with a siphon trap; it does not form a receptacle for retaining filth, and any fat adhering to the sides of it can easily be washed away with hot water.

96. Damp-Proof Course.—*Built in wall. Two courses of slate laid so as to break joint, and set in Portland cement.*

A damp-proof course is necessary to prevent moisture rising in the wall and making the house damp.

When properly constructed, this is an efficient and cheap form of damp-proof course, it is, however, rather liable to fracture.

The level of the ground outside the house should, if possible, be below the damp-proof course; where this is impracticable, the earth should be kept away from the wall, either by means of a "dry area," or a vertical lining of some material impervious to moisture.

97. Damp-Proof Course.—*Built in wall, Perforated stoneware.*

This is one of the best forms of damp-proof course. It is less liable to fracture than the one previously described, and also admits air underneath the basement floor.

98. Damp-Proof Course.—*Built in the wall, composed of asphalte $\frac{3}{4}$-inch thick.*

This is also a very good form of damp-proof course, as it has no joints.

99. Soil Pipe.—*Outside the house, with ventilating pipe, of the same size as the soil pipe, carried up above the roof.*

The soil pipe should, whenever possible, be outside the house; as, if there be any defect, the air from the soil pipe will escape outside, instead of inside the house. The soil pipe may be made of stout lead, as in the present instance, or of thick iron, with its outer and inner surfaces covered with a preservative coating, and thoroughly well jointed.

100. Inspection Chamber.—*Covered by stone, with iron door.*

In the present case the chamber is covered with glass, so that it may be easily examined; but in practice it would be covered with a stone supporting an iron door which is here seen placed against the wall.

This chamber allows of an easy mode of access to the drains for inspection and cleansing. The drains are continued through the floor of the chamber with open glazed stoneware channels. By means of this arrangement each drain can be separately examined and cleansed.

The drains entering this chamber are as follows:—

1. From gully for surface water.
2. From gully receiving waste water.
3. From soil pipe.
4. From water-closet in basement.

101. Air Brick of Stoneware.—*To admit air under floor.*

The space under the floor should be ventilated, to prevent stagnation of Air and "Dry-rot."

102. Open Trapped Gully.—*For surface water; discharging into Inspection Chamber.*

See paragraph 95.

103. Special Gas Pendant.—*Showing method of providing ventilation, by Air Chamber and flue, with iron plate to strengthen joists.*

See paragraph 36.

104. Drain under House.—*Heavy iron Socket-pipe coated with a preservative composition, and with gas-tight joints.*

House drains should be laid either with iron pipes, or with stoneware pipes cased in concrete ; they should be thoroughly well jointed, and tested to prove that they are perfectly water-tight. If the fall of the pipes is less than one foot in fifty feet (or say 2½ inches in 10 feet), special means of flushing should be provided.

105. Concrete.—*Layer of Concrete 6 in. thick under the whole of the Basement Floor.*

The ground upon which a house stands should be covered with a layer of impervious material, such as cement concrete, or asphalte, to prevent air from the soil being drawn into the house.

106. Inlet Ventilator.—*For the admission of Fresh Air.*

This is another simple form of inlet ventilator, consisting of a kind of drawer with vertical partitions, which direct the air upwards ; by pulling the drawer a greater or less distance the quantity of air can be regulated.

107. Outlet Ventilator.—*For the escape of Vitiated Air.*

See paragraph 66.

FRONT AREA.

108. Manhole.—*For access to drain and disconnecting trap.*

By means of this Manhole, easy access is obtained to the "disconnecting trap" on the house drain, and also to the drain itself, and to the branch from the gully in the front area. The drain, passing under the house, runs in a straight line from the inspection chamber in the backyard, to this Manhole, so that it can be examined throughout its length and readily cleansed, without disturbing the floors.

109. Disconnecting Trap.

The object of this trap is to prevent air from the public sewer passing into the House Drain.

110. Air Inlet to Manhole.

Fresh air enters through this opening into the Manhole, and passing through the house drain and up the soil pipe, escapes above the roof of the house, by means of the ventilating pipe ; thus a current of air is always passing through the drain and soil pipe, and an accumulation of foul air is prevented.

111. Clearing Branch with Stoneware Stopper.

The object of this pipe is to be able to pass a rod down the drain, between the trap and the public sewer, in case of obstruction ; but this is very seldom necessary.

The mouth of this pipe is closed with an air-tight stopper, secured with cement.

112. Open Trapped Gully.—*For Surface Water, discharging into Manhole.*

See paragraph 95.

113. Small movable galvanised iron Dust-bin.

The Dust-bin should be small, made of some impervious material, and movable.

114. Iron Grating for Inlet Ventilator to Room.

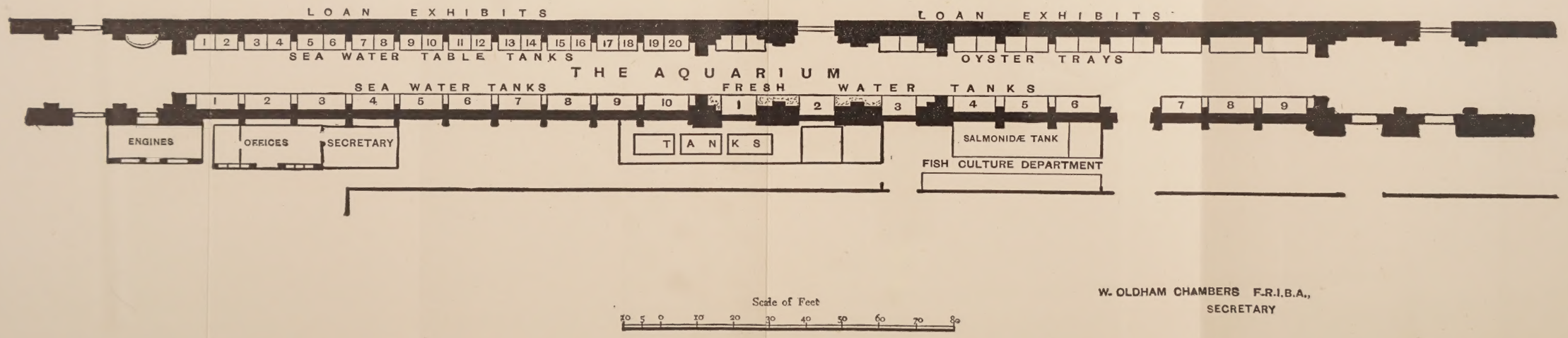
See paragraph 106.

115. Air-brick of Stoneware.—*To admit air under floor.*

See paragraph 101.

NATIONAL FISH CULTURE ASSOCIATION,

SOUTH KENSINGTON.


LOAN EXHIBITS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
SEA WATER TABLE TANKS
LOAN EXHIBITS
OYSTER TRAYS
THE AQUARIUM
SEA WATER TANKS
1 2 3 4 5 6 7 8 9 10
FRESH WATER TANKS
1 2 3 4 5 6
7 8 9
ENGINES
OFFICES
SECRETARY
T A N K S
SALMONIDÆ TANK
FISH CULTURE DEPARTMENT
Scale of Feet
10 5 0 10 20 30 40 50 60 70 80

W. OLDHAM CHAMBERS F.R.I.B.A.,
SECRETARY

To face page 85.

ILLUSTRATED

HANDBOOK TO THE AQUARIUM

AND

FISH CULTURE DEPARTMENT.

BY

W. OLDHAM CHAMBERS, F.L.S., F.R.I.B.A.,

Secretary to the National Fish Culture Association;
Gold Medallist in Fish Culture; Décoré Norwich, Edinburgh, and London Fisheries Exhibitions;
Grande Médaille d'Argent et Diplome d'Honneur Société Nationale d'Acclimatation de France.

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INTRODUCTION.

NOT in the usual stereotyped phraseology, but in sound earnest conviction, I admit that many of my immediate friends holding seats on the Council of the National Fish Culture Association would have performed the onerous duties of piloting the Aquarium at South Kensington in a manner which would have reflected credit on themselves, and have thrown lustre upon the Association. But from the kind and unanimous expression of good-will which emanated from the Council, and from the friendly promises of support that were given me, I acceded to the request that I should accept the responsibility of the office, and I venture to hope that this little *Handbook* may not be devoid of interest to the visiting public attending the International Health Exhibition of 1884. To some of my friends more particularly am I indebted for their promises of assistance in contributing to the Journal of the *Handbook*, which will be published periodically during the forthcoming six months. These gentlemen I have recognised in the "Complimentary List," which, I hope, will be extended in future editions of our publication.

In compiling my brief sketches on the natural history of the fish exhibited in the tanks, I have had recourse to the notes I have made from personal observations from time to time during the past few years, and I am indebted to Couch, Yarrel, Buckland, and other authors, and well-known works of reference, upon matters of detail likely to prove of interest to the public. In illustrating the marine and fresh-water fishes, special attention must be directed to the extreme kindness of Dr. Günther, F.R.S., in granting facilities to artists to sketch different species of

fish in his very valuable and interesting collection in the new Natural History Department of the British Museum, South Kensington.

This short article really introduces the visitor at the Health Exhibition, and the reader of the *Handbook*, to the live fish, the collection of stuffed fish, and the Fish Culture Department contained in, and close to, the Aquarium. The many questions connected with fish, and the fishing interests, require, however, but little introduction to the great body of the general public. The great Exhibition of 1883, the previous Exhibition at Norwich (with both of which it was my privilege to be associated on the Executive Staff), and the many discussions and lectures which took place, chiefly, perhaps, in connection with those exhibitions, roused more fully than it had ever been roused before, the attention of the British Public, to the many important and very interesting questions connected with fish, fishing, and fishermen.

It would be more than unnecessary, therefore to go over ground which has recently been traversed so frequently and so well, and in this Introduction it is sufficient to remark only generally upon a subject which, in all its different branches, is gradually and surely forcing itself upon the attention, not merely of the people, but of the different Legislatures, of the entire civilised world. The progress which has been made in the general education of the minds of the people in respect to everything connected with fish, has, even in this age of advance, been almost unique. In the Nineteenth Century everything has made, and is making, wonderful advance, and it is small matter for surprise that so interesting and so extensive a subject as that which is connected with fish life and the fish world should not have escaped the general progressive movement.

Indeed, it would have been remarkable if the habits, the nature, and the means of culture of the finny tribes had failed to attract a good deal more than passing notice. Apart from the hundreds of thousands of persons living on our coasts, and on the coasts of the different countries

throughout the Old and the New Worlds, whose instincts are keenly alive to all which may affect, for good or evil, that by which they gain their livelihood, there is a by no means insignificant proportion of our population to whom the habits of fish, the culture of fish, the foods of fish, and the haunts of fish, are of very great interest from a recreative point of view. And this body, who are interested in fishing as a recreation, can be treated in no other way, even if it were desired, than with respect and esteem, for the followers of Isaac Walton, wherever they are found, are, experience invariably shows, never merely selfishly wrapped up in the pursuit of their own pleasure, but are, as a rule,—and a rule too which may be said to be almost without the usual exception, willing—ay, and frequently anxious—to inform their minds in every possible way about the prey they seek, and to protect that prey with all their strength when it is necessary to do so.

The exhibition of everything connected with fishing, and the discussion of all subjects connected with fish, fish culture, and fisheries, have thus a peculiarly close connection with a Health Exhibition. As a recreation, fishing, to be recreative, must be carried on in the open air and in fine weather, and these necessary accompaniments to enjoyment are obviously important adjuncts to Health. As to the other aspect of fish, to which we have referred, the healthy action of fish food upon the brain as well as the body generally, has, especially of late, been repeatedly urged in public, and thus again the fish question is very nearly associated with a Health Exhibition. Moreover, with great questions of cattle disease and consequent increased prices of meat, the mind of the public naturally turns to other sources for food supply, and the first and most important reply to the anxious question, "Whence shall we obtain fresh, wholesome, and cheap food?" is "Your fisheries." In order to obtain the best supplies of fish in the most healthy and flesh-yielding condition, Fish Culture must be carefully studied, and all possible information respecting the habits and diseases of fish must be collected

and carefully made use of. By these means, the men who "do business on the great waters," the angling public, and the general public, will be greatly benefited, and in fact, infinite advantage must necessarily accrue to the entire community.

To secure these and other similarly valuable objects the National Fish Culture Association of Great Britain and Ireland has been established, and the results of its establishment have hitherto been of a remarkably useful and satisfactory character. In another portion of this *Handbook* there will found a history of the formation of this Association, the need of which has long been felt; and I feel that it is needless, in this Introduction, to trouble the reader with any lengthened details as to the work or proceedings of the National Fish Culture Association.

W. OLDHAM CHAMBERS.

SOUTH KENSINGTON,
May 1, 1884.

THE HISTORY OF THE NATIONAL FISH CULTURE ASSOCIATION.

It is necessary, in a few brief sentences, to chronicle the step which led to the formation of the National Fish Culture Association and to its present connection with the National Health Exhibition.

Recent years have witnessed great advance in the steps which have been taken not only to enlighten the public mind upon questions connected with fish culture, but to encourage generally the study of the habits and nature of both marine and fresh-water food fishes, and one of the results of this advance was the inauguration of an Association devoted to the study of Fish Culture in all its branches. It is to Mr. R. B. Marston, the able editor of the 'Fishing Gazette,' and I may say, without egotism, to myself, that the credit is due for the commencement of this Association, which resulted in the convention, on the 20th of December, 1882, of a public meeting, which was held, by the courtesy of the Prime Warden of the Worshipful Company of Fishmongers of the City of London, in the Fishmongers' Hall. The meeting was convened for the purpose of establishing a National Fish Culture Association for Great Britain and Ireland, to have for its objects the improvement of the methods of cultivation of our fresh-water and marine food fishes, and the consideration of the best possible means of dealing with the different species.

The meeting proved, it may be remarked, one of the most influential assemblies ever held in connection with the fisheries of this country. The chair was occupied by the

Most Honourable the Marquis of Exeter, and an interesting and important discussion of matters in connection with fish culture ensued. A council and executive officers were appointed, and the Marquis of Exeter and Sir James G. R. Maitland, Bart., agreed to act respectively as President and Chairman. The objects of the Association and the rules of government were carefully discussed at subsequent meetings of the Council, and were eventually agreed upon.

The preliminary business having been thus transacted, the time arrived when the Council determined that, for the welfare of the Association, and in harmony with the objects which its promoters had in view, practical work should be commenced without further delay.

Sir James Maitland was compelled to resign his connection with the Association on account of the great distance he resided from London, and his consequent inability to attend Council meetings. This was a matter of great regret, but the Marquis of Exeter very kindly accepted the position of Chairman of the Council, in addition to being President of the Association ; and E. Birkbeck, Esq., M.P., accepted the office of Deputy Chairman. The Council at once received the great advantage and benefit of their advice and vast experience in matters relating to fish and fishing.

An application was made to the Executive Council of the Health Exhibition for permission to have a building erected in the Exhibition Grounds for the purpose of carrying on Fish Culture, and this request was most cordially agreed to.

This agreement to the request of the Association was eventually followed by the conclusion of an arrangement for the management of the Aquarium at South Kensington being transferred to the National Fish Culture Association. In connection with this matter, it is not out of place here to remark that the Council feel that the Association must be warmly congratulated upon this concession, as they are now enabled, from the extensive resources at their command, to be in a position to carry on operations in marine

and fresh-water fish culture upon a scale which it would have been impossible for them to attempt without the means thus placed at their disposal. It is to Edward Birkbeck, Esq., M.P., that the credit is due of carrying to a successful issue the negotiations in this matter.

The results of the investigations will be chronicled from time to time in the Journal of the Association, which will be periodically published during the period the Health Exhibition remains open.

The Council feel that every acknowledgment must be tendered to the Executive Council of the Health Exhibition for the material assistance, courtesy and kindness accorded to the Association upon all occasions, and it will be their earnest desire to maintain the Aquarium and Fish Culture Department in a thoroughly efficient manner for the benefit of the public, and for the advancement of the Science of Pisciculture throughout the country.

OBJECTS OF THE ASSOCIATION.

It will be of interest to the public to note the objects of the Association whose birth has been thus recorded. These are as follows :—

To encourage and develop the Sea and Inland Fisheries of the United Kingdom, and thereby increase the food supply of the country :—

By collecting, arranging, tabulating and publishing in periodical Reports information from this and other countries on Fish Culture and Fisheries ;

By founding, promoting, or acquiring establishments for Fish Culture, and by aiding or undertaking such experiments as shall seem advisable ;

By using its best endeavours, with the consent of the authorities, to encourage and assist in the stocking of public and all other available waters which are placed under suitable regulations with Fish, for the recreation and benefit of the community ;

By advocating the formation of Laboratories, Aquaria, and Schools for studying the science of Ichthyology and Fish Culture, and by the formation of a Library and Museum, and by holding meetings for discussion on all subjects connected with Fish, Fisheries and Fishermen ;

By encouraging and rewarding Fishermen and others to assist in carrying out investigations and observations in the temperatures of the sea, the spawning grounds, food, habits, migrations and enemies of our Marine Fishes ;

By collecting and tabulating information on the effects of the various modes of Fishing carried on in lakes, rivers, estuaries, and seas, and by suggesting remedies to those modes which have proved to be injurious;

The words Fisheries, Fish Culture, Fish Supply, &c., are understood to apply to all marine or fresh-water animals and plants available for food or useful for other purposes.

LIST OF OFFICERS.

President and Chairman.

THE MOST HON. THE MARQUIS OF EXETER.

Deputy Chairman.

E. BIRKBECK, Esq., M.P.

Council.

T. ANDREWS, Esq.
R. BARCLAY, Esq.
C. BATES, Esq.
J. BRUNTON, Esq., M.D.
W. BURDETT-COUTTS, Esq.
C. L. BUXTON, Esq.
C. C. CAPEL, Esq.
J. T. CARRINGTON, Esq., F.L.S.
W. OLDHAM CHAMBERS, Esq., F.L.S.
F. C. CLENCH, Esq.
J. H. CROSSMAN, Esq.
Lieut.-Col. CUSTANCE.
GREVILLE FENNELL, Esq.
H. FENNELL, Esq.
J. FORBES, Esq.
FRANCIS FRANCIS, Esq.
C. E. FRYER, Esq.
P. GEEN, Esq.
Dr. GÜNTHER, F.R.S., &c.
Professor HUXLEY, P.R.S., &c., Inspector of Fisheries.
A. JARDINE, Esq.
H. LEE, Esq., F.G.S., F.L.S.
Rev. J. J. MANLEY, M.A.
T. J. MANN, Esq.
R. B. MARSTON, Esq.
O. T. OLSEN, Esq., F.L.S.
J. L. SAYER, Esq.
Col. SEDDON.
W. SENIOR, Esq.
S. B. SHARPE, Esq.
J. WILLIS-BUND, Esq., LL.D.
Lieut.-Col. STUART WORTLEY.

Treasurer.

W. BURDETT-COUTTS, Esq.

Secretary.

W. OLDHAM CHAMBERS, Esq., F.L.S.

Bankers.

Messrs. COUTTS & Co.

COMPLIMENTARY LIST.

THE Council of the National Fish Culture Association is desirous of acknowledging the following special services that have been rendered in the Aquarium and Fish Culture Establishment, and has much pleasure in testifying to the uniform acts of courtesy and kindness which have been so liberally accorded to the Council in its endeavours to make this Department attractive and instructive to the Public.

The Contributors of Stuffed Fish, Fish-Eating Birds, Paintings and Prints of Fishing Subjects are enumerated in the Loan Collection.

ATKINS' WATER SOFTENING AND PURIFYING COMPANY, 62, Fleet Street, London. Apparatus for softening and purifying the water.

ANDREWS, THOS., Esq., Westgate House, Guildford. Contributions of Trout fry (*S. fario*) to the Fish Culture Department.

BRIGHTON AQUARIUM CO., THE, for donations of live fish to the tanks of the Aquarium.

BAIRD, THE HON. SPENCER, Washington, America. Contributions of California Trout eggs (*S. iridea*) to the Fish Culture Department.

BECCLES, THE WORSHIPFUL THE MAYOR AND CORPORATION OF, for allowing their waters to be netted for purposes of Fish Culture.

BEDFORD, K.G., The DUKE OF, Specimens of Golden Orfes in the tanks of the Aquarium.

BUSSELL, CHARLES GIBBS & Co., Glass Warehouse, 75, Wells Street, Oxford Street, London, who supplied free of

cost fifteen glass fish aquaria and globes and two corner fish tanks, with silvered plate glass wall surfaces at back, for use in the Aquarium.

CAPEL, C. C., Esq., Foots Cray, Kent, for a brace of Gillaroo Trout for the Salmonidæ Tank, and contributing articles to the Journal of the *Handbook*.

COLEMAN, W. PEARSON, Esq., Whitstable, Kent, for supplying live marine food fishes to the tanks and specimen Oysters in various stages of growth.

CRAGG, J. S., Net Manufacturer, Lowestoft, for supplying Mackerel, Herring, Sprat, and other drift-nets free of cost for the purpose of decorating the walls of the Aquarium. (These nets were awarded the Gold Medal at the recent Fisheries Exhibition, London.)

CUSTANCE, COLONEL, Weston House, Norwich. Specimens of Trout (*S. fario*) for the tanks.

CROSSLEY BROS., LIMITED, Manchester and London, for lending two "Otto" gas engines, situated in the Aquarium Pumping Station, where they have been working continuously night and day since April, 1883. These "Otto" engines are worked by the ordinary lighting gas and dispense with the dangerous boiler, the unsightly and dirt-diffusing chimney and the costly attendance of a steam-engine and boiler; moreover, they can be started at a moment's notice. From a "Health Exhibition" point of view, these engines are interesting, inasmuch as they represent the solution of the smoke nuisance difficulty so far as the application of motive power is concerned. They are made from ½ up to 100 horse-power, and can be worked with an economy as yet never touched by steam of equal power.

DAY, DR. FRANCIS, F.L.S., for interesting and instructive articles for the Journal of the *Handbook*.

DAVIS, JOSEPH, & CO., Manufacturing Opticians, 6, Kennington Park Road, London, S.E., for supplying free of cost to the Aquarium and Fish Culture Department,

their Royal Polytechnic Barometers, Thermometers, and other scientific instruments.

EVERITT, W. S., Esq., Carlton Colville, Lowestoft, for providing specimens of fresh-water fishes to the tanks, and spawning fishes to the Fish Culture Department.

EXETER, THE MOST HON. THE MARQUIS OF, Burleigh Park, Stamford, for supplying various fresh-water fishes to the tanks, hatching and rearing appliances, models and microscope for use in the Fish Culture Department.

FFENNELL, HENRY, Esq., 'Land and Water' office, London, for contributing articles to the Journal of the *Handbook*.

FRYER, E. C., Home Offices, Whitehall, for contributions in the Journal of the *Handbook*.

GEE PATENT AUTOMATIC FOUNTAIN COMPANY, THE, for supplying, for ornamental purposes, automatic fountains in the Fish Culture Department.

GUNN, MR. T. E., St. Giles, Norwich. Contributions of live fresh-water fishes indigenous to the rivers and broads of Norfolk.

HUMPHREYS, MR. J. CHARLTON, Albert Gate, London, S.W. (specially appointed sole contractor for all the Iron Buildings of the Health Exhibition), for erecting upon his portable principle the corrugated iron building for the use of the Board Room and Secretary's offices adjoining the Aquarium.

JARDINE, A. G., Esq., 38, Old Change, E.C., for contributing live fresh-water fishes to the tanks, and for his assistance in matters connected with the Aquarium.

JEX, EDWARD, Esq., C.C., for providing and fitting up specially constructed tanks for use on board his smacks and carrier steamers for the purpose of supplying live marine food fishes to the Aquarium.

LEE, HENRY, Esq., F.G.S., F.L.S., Margate, for his valuable services in contributing attractive articles in the

periodical Journal of the *Handbook* and for his assistance in all matters appertaining to the Aquarium.

LEETE, EDWARDS AND NORMAN, Messrs., Engineers, Euston Road, London, for supplying their patent rotary pumps in the Aquarium Pumping Station, where they have been working continuously by day and night since April, 1883. These pumps are made in vulcanite, and were awarded a Diploma of Honour at the recent International Fisheries Exhibition.

LUBBOCK, REV. H. H., Hanworth Rectory, Norwich, for his assistance in supplying fresh-water fishes to the Aquarium and spawning fishes to the Fish Culture Department.

MANN, T. J., Esq., The Grange, Bishop's Stortford, for supplying the various specimens of Sea Anemones to the tanks, and for his unwearied assistance in arrangements connected with the Aquarium, and for his contribution to the Journal of the *Handbook*.

MARSTON, R. B., Esq., 'The Fishing Gazette' office, 188, Fleet Street, London, for contributing valuable articles and papers to the Journal of the *Handbook*.

MAIGNEN, P. A., Esq., 22 & 23 Great Tower Hill, London, E.C., has supplied his patent "Filtre Rapide" for the purification and softening of the Fresh Water Tanks in the Aquarium and Fish Culture Department of the Association. The Sea Water has also been clarified by one of his large supply "Filtres Rapides," which last year was used for the same purpose, to the great satisfaction of the Executive Committee, who voted a special letter of thanks at their last meeting.

OLSEN, O. T., Esq., F.G.S., F.L.S., for contributions of live marine fishes to the tanks and for his articles to the Journal of the *Handbook*.

POLAND BROS., Lower Thames Street, London, for a continuous supply of living crustaceans to the tanks and specimens in spawn for the Fish Culture Department.

PUGH, ROBERT L., Esq., 16 Comeragh Road, West Kensington, London, W. Supplying live fresh-water fishes to the tanks and spawning fishes to the Fish Culture Department.

SANDFORD, W. G., Esq., Cromer, for supplying live Crabs and Lobsters for experimental purposes in the Fish Culture Department.

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SAYER, J. LAST, Esq., C.C., Lower Thames Street, London, for a supply of live marine fishes to the tanks.

SUFFIELD, THE RIGHT HON. LORD, K.C.B., Gunton Park, Norfolk, for a constant supply of live fresh-water fishes to the tanks and spawning fishes to the Fish Culture Establishment.

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WILLIAMSON, W. H., Esq., C.C., Lower Thames Street, London, for a regular supply of molluscs and crustaceans to the tanks and to the Fish Culture Department.

DESCRIPTION OF THE AQUARIUM.

In the autumn of 1882 the Executive Committee of the Great International Fisheries Exhibition began to realise the vast proportions the undertaking was assuming, and after much consideration they determined to construct an Aquarium in which living specimens of fresh-water and marine fishes could be exhibited to interest and instruct the public.

The Executive, being most anxious that the tanks should be constructed in the most efficient manner, and upon the most approved principles, appointed a sub-committee of specialists, whose experience in the subject particularly qualified them to advise in matters appertaining thereto. The following gentlemen constituted the committee :—

Sir J. G. R. Maitland, Bart., T. J. Mann, Esq., Col. Stuart-Wortley, W. Fell Wood, Esq., A. G. Jardine, Esq., Francis Day, Esq., J. T. Carrington, Esq., Henry Lee, Esq., and W. Oldham Chambers, Esq.

The site selected for the erection of the Aquarium was that portion of the permanent structure of the Royal Horticultural Gardens known as the western arcade, and the position presented many important advantages paramount to an undertaking of this nature.

The Aquarium comprises ten large sea-water tanks and nine fresh-water tanks, each 12 ft. by 4 ft. deep, built with hard bricks and cement, and cased on the inside with asphalte. The plate glass forming the front is one inch in thickness. Immediately under the tanks is constructed a continuous cistern, in which is discharged the overflow water. The back and side walls of the tanks are orna-

mentally fitted up with rockwork, by Mr. Pulham, of Broxbourne.

The sea-water for the tanks consists of 65,000 gallons, and was brought from Brighton by Messrs. Hudson & Co., of Pimlico, who were employed for a similar purpose by the Crystal Palace and Westminster Aquarium Companies. The fresh water is supplied from the mains of the West Middlesex Water Company; and in order to prevent the perils the fish would be subjected to from the extreme hardness of the water, the Executive Committee accepted the offer of Messrs. Atkin & Co. to soften the supply at a nominal charge by means of their patent softening and filtering apparatus. The advantage of this apparatus to the Aquarium cannot be too highly praised, and the Council are pleased to state that the services of this firm have again been recently secured, after the fresh-water tanks and reservoirs had been cleaned out for the present season.

There are also twenty slate table tanks and twelve oyster trays, with similar cisterns under, for circulation, as before described.

In addition to the above is a very large tank in the Fish Culture Department, now used to exhibit various species of trout, and, adjoining it, is a specially constructed habitat for the display of Fish-eating Birds.

The supply of water to the tanks has been carried out at a very large cost by means of vulcanite pipes, as the purity of the material and its immunity from decomposition render it of special service in the provision of the sea-water to the tanks. This work was performed by Messrs. Leete, Edwards & Norman, Engineers, of Euston Road.

The motive power necessary to maintain the circulation of the fresh and sea-water is obtained by means of two four-horse Otto gas engines, constructed by Messrs. Crossley Brothers, of Leeds, and the fact that these engines have been in constant use night and day for nearly a twelvemonth without reparation of any material importance, is a sufficient guarantee as to the excellent principle upon which these valuable engines are constructed.

The pumps were constructed in vulcanite by Messrs. Leete, Edwards and Norman, who have very kindly given the benefit of their large experience in work of a similar character.

Altogether, the Aquarium probably forms one of the best places for exhibiting sea and fresh-water fish in or about London, and there is every reason to anticipate that the popularity with which the Aquarium was received by the enormous crowds of the general public who visited it upon the occasion of the successful Fisheries Exhibition of 1883 will be repeated upon the occasion of the National Health Exhibition of 1884.

DESCRIPTION OF THE FISH CULTURE DEPARTMENT.

THE Department assigned to Fish Culture is situate at the back of the fresh-water tanks in the Aquarium.

The water service being a matter of considerable, if not vital, importance, has received every attention from the Council.

A large store-cistern has been fixed over the arcade of sufficient contents to provide against accident or temporary stoppage in the water supply. It is cased up in wood, and has a chamber or space of six inches all round, which has been filled up with silicate cotton in order to preserve the water from the deleterious effects of change in temperature.

The supply to the cistern is taken from the public mains of the West Middlesex Water Company, and this being naturally of a very hard nature, the services of Mr. P. A. Maignen, of Great Tower Street, London, have been brought into requisition, and an apparatus on their Patent principle for filtering and softening the water has been fixed over the cistern. This has the desired effect.

The supply pipe to the appliances is carried along the wall in the rear, and has separate branch connections and taps fitted to each. The drain for the overflow water is fixed under the benches, into which the several wastes are connected. All the principal piping is in galvanised iron tubing, and is visible in case of alterations or repairs being required.

The appliances have all been specially selected on the

most approved and scientific principles for the purposes to which they are severally required, as it is the intention of the Council to carry on experiments and investigations in both marine and fresh-water fish culture during the coming season.

The Marquis of Exeter, President of the Association, very kindly presented the department with some of the hatching and rearing apparatus exhibited at the recent Fisheries Exhibition, and designed by Mr. Silk, pisciculturist to his Lordship. These consist chiefly of hatching and rearing appliances for Salmonidæ. They were awarded several important medals and prizes at the recent Exhibition, and naturally hold high rank among the leading inventions of the day for the culture of Salmonidæ.

The Marquis of Exeter has also lent a working model of Trout Ponds, models of improved Salmon Ladders—jumping ladder, and swimming ladder, together with a model of a Fish Sluice.

The other appliances in the department have been designed by Mr. W. Oldham Chambers, who received for his inventions several medals and diplomas at the late Fisheries Exhibition. The appliances consist of hatching boxes for deep-sea adhesive eggs, such as those of the herring ; vases for floating eggs, such as the cod ; boxes for hatching the spawn of fresh-water fishes on the principle of the "Lund" hatcher, but with several improvements for the transit of the eggs, if desired ; a hatching box for the eggs of Salmonidæ upon the underflow system ; and an apparatus for rearing Salmonidæ fry in which the water is maintained in motion by a simple and ingenious plan of admitting it at an angle of 45°, and thereby setting up a miniature stream or current.

The eggs that have been hatched this season consist of *S. ferox* and *S. fario.* It is intended another year to secure a greater variety of the Salmonidæ.

The Council are indebted to the Hon. Spencer Baird, Commissioner of Fisheries for the United States of America, for a consignment of eggs of *S. iridea.*

Mr. T. Andrews, of Westgate House, Guildford, has very generously made the Department a present of *S. fario* eggs in selected strains, and the Association is indebted in other directions for loans or presents of live fish. These are duly referred to in the Complimentary List.

THE CULTIVATION OF SALMONIDÆ.

THE culture of Salmonidæ forms one of the most interesting branches in the study of fish, and no excuse is needed in introducing the subject to the notice of the public.

The first consideration in the cultivation of Salmonidæ is to provide an abundance of suitable pure water, and upon this, primarily, depends the success in hatching.

The water to be used may be divided into two classes ; first, that for hatching, and second, that for rearing and growing. The water necessary for hatching must be of the purest nature possible, of one regular temperature (about 45°), and should contain a fair amount of oxygen, free from animalculæ, sediment, and other impurities. Where practicable, water should be used from public sources, as its freedom from pollution when so obtained may be depended on. Then comes spring water, which may be raised by manual, steam, or other motive power.

One great necessity is a large covered storage tank or cistern. An ample store is most necessary in case of a burst pipe, short supply, or other misadventure, which frequently happens during the fish culturist's experience.

The second description of water is for the rearing of the Salmonidæ ; and, strange as it may appear, the very purity of the water, which is so essential during hatching, is death to the young fry on account of its hardness and freedom from insectile life. The water must, of course, be pure, but it is imperative that it should be charged with animal and vegetable life, for without this minute food the young fry will soon—far too soon—die by the thousand. If possible, collect the water from some little shady stream, or rivulet, that has for a distance purled along over stones and rocks,

softening and oxygenating in its transit. By all means, in selecting a stream, see that it never dries up ; always have plenty of water, never too little ; no man ever reared large fish with a scanty supply of water. Secure a fair, even, and regular supply ; and perfect the ponds against floods with as much security as against droughts. This can easily be arranged by using a side branch, or cutting, which will allow the overflow to run back into the main stream.

Thus, as to water, it is important to remember that the supply must be plentiful, and not liable to pollution from factories, sewage, sheep washings or other like impurities. Water at all muddy for hatching is most detrimental, but for rearing young trout or salmon beneficial results will be found by occasionally stirring up the mud if the fry appear at all sickly.

The next consideration is the hatching house, and as to this, the roof should, if possible, be thatched, as it preserves the building from the extremes of either frost or heat. An ample supply of light must be admitted, as this is imperative to successful operations, and during sunny days shades or blinds can always be supplied. The floor should be brick, with a well-trapped drain to carry off the waste water. A good paraffin stove will be found sufficient to preserve the house from severe frosts. Fit up in the windows good benches, and add a white enamelled iron sink with tap for water supply over. This will be found most essential. The walls of the house can be lined with boards to assist in retaining an even temperature. A small desk will be found of great service for recording notes.

The building necessary for a large establishment, to hatch, say 300,000 eggs, will naturally be far in excess of the above, which is only intended for a small private enterprise.

It is advised to place over the store cistern a small filter, through which to pass the water if it is found to be thick during the hatching season.

The system of filtration can either be charcoal, broken up small, or by a series of flannel screens, let into the sides

of the box for the water to pass through, and capable of being removed easily for the purpose of being cleaned.

It may be useful to give a list of the appliances necessary, and these are as follows:—A suitable hatching apparatus. There are two principal apparatus, the *overflow* and the *underflow* systems. The former is that invented by M. Coste many years ago, and the system is to place the eggs on gravel in slate or wooden trays stepped one above the other, and to allow the water to pass over the eggs from one tray to another. The underflow system is to place the eggs in trays raised above the bottom of a box, allowing the water to enter at the bottom, pass through the trays, and so away at an overflow or waste. Any dirt or sediment is caught on the underside, and does not come into contact with the eggs. By placing them in perforated zinc trays they can easily be removed, both before, during, or after hatching. The apparatus is connected by a lead pipe with the cistern, the supply being regulated by a tap. The whole takes up very little room, and is easily stored away when not in use. A box, say, 5 ft. long and 15 inches wide, is capable of hatching 30,000 Salmonidæ. When in use the box is covered with a light frame, over which dark thick calico is stretched. It is most important that the apparatus should be covered; experience teaches fish culturists that the eggs hatch out better and stronger in the dark, and it assimilates more to natural hatching. During the period the eggs are in the trays, they must be looked over at the least once a day, and great care should be exercised to pick out the dead eggs, which can easily be recognised by their white or opaque appearance.

I strongly recommend small private fish culturists to purchase ova already eyed, instead of spawning it themselves, unless they have suitable facilities at hand. It has been intimated by an eminent fish culturist, that with water at a temperature of 50° the eggs will hatch out in 50 days, and for every degree one way or the other it will either advance or retard the fish 5 days. With water at the above temperature

the umbilical sac will last 30 days. No particular attention is required during the alevin period : the rate of mortality is not great, and the dangers to guard against are comparatively few. The newly hatched have a strong desire to congregate together up the corners of the hatching trays and will escape by the smallest possible hole—in fact it is sometimes surprising to notice the power they have to wriggle through an almost invisible crevice in the trays. The fish must be kept in the trays until almost a week before they have lost their umbilical sac. The most trying and difficult stage now presents itself, for if the fry are allowed to remain in the trays after the absorption of the sac, the very purity of the water, which up to that time has been instrumental in hatching, will be the means of starving the fry. In my opinion it is necessary that the young salmonidæ should be educated—if I am allowed to use the term—in the art of feeding before being turned adrift, and once they are able to feed themselves, half the difficulty is over. To further this object, I have invented an apparatus which maintains a steady current of water, in which the food is held in suspension for a considerable period ; this invention is in use in the Fish Culture Department.

Feeding must be attended to with the greatest regularity. Commence at first with only one or two meals a day, and gradually increasing these to three or four meals a day. Great care must be taken at each meal that the requirements of the fish are not exceeded.

Salmonidæ are particularly fastidious in the way of diet. So long as the food is held in suspension in the water, so long will they consume it, but when once it has reached the bottom they disdain to touch it. During the early period of a young trout's life, the most nutritious food upon which it can be fed is finely chopped raw liver. An admirable chopper for the purpose can be obtained from Messrs. Bradford, in High Holborn.

Great precaution must be exercised to give fresh food every day ; if the meat is at all tainted, fungoid growth is at once created.

There are, of course, other descriptions of food, which perhaps some fish culturists would prefer to liver, such as curd, hard-boiled eggs, and biscuit.

Constant feeding must not be neglected, and big fish cannot be grown unless plenty of food is administered at regular intervals. Nothing repays time, trouble, and expended capital, sooner than attention in this particular.

After the fish are fairly established in the art of feeding, the period has arrived when they must be turned out into the open waters, and selecting a suitable habitat for them requires a vast amount of careful consideration and forethought.

I particularly advise the nursery pond being of such dimensions, that every portion of it is under entire control or management; it should be so designed that the water can easily be run off by means of a sluice at one end into another nursery pond upon a lower level.

The bottom of the nursery pond should have a lining of gravel six inches in depth; a series of ponds should be supplied in number according to the requirements of the establishment.

The fry ought frequently to be looked over to select the large fish, and to place them in ponds by themselves in accordance with their size and species.

A few aquatic plants should be provided in the ponds for the purpose of giving shade to the fish in sunny weather.

The fish must be as regularly fed and attended as they were before being turned out into the open waters: the description of food previously recommended must be continued. With ordinary care in sorting, the fish may be allowed to remain in the nursery ponds until the beginning of the following year, when they should be removed into large ponds suitable for yearling fish. Nothing should be placed in the pond which cannot be removed at a minute's notice.

Feeding must still be continued, but not so frequently as before described; twice a day will be all sufficient, and the

size of the food can be increased, but only in proportion to the size of the fish. It will not be amiss to vary the food somewhat, and place in the water some fresh-water shrimps, and also throw in occasionally a few small garden worms, and in place of liver give sheep's heart finely chopped.

If proper care has been exercised in this respect, the fish will soon be about six inches to eight inches in length, and the trouble that has been expended upon them will begin to be repaid and appreciated. It is highly necessary that the fish should be carefully looked over periodically, and the large ones picked out and removed to another pond; it is by sorting into sizes that the percentage of loss through cannibalism is materially diminished.

At the end of the second year the fish may be removed to larger ponds to be allowed to mature. The construction of these ponds must be similar to the yearling ponds, only of increased dimensions. Always bear in mind, that whatever the size of the pond, and for whatever purpose it is required, whether for large or small fish, it must be under complete control.

Feeding must still be continued, but not so frequently, and I would urge that the fish should always be fed in the same spot. Coarse animal food may be given, and a few live minnows may be placed in the water as a change of diet.

A few words may be said as to spawning. Prior to the fish passing up into the shallows to spawn, it is advisable that some preparation should be made for them, such as cleaning out the streams and adding gravel if necessary for the beds as well as placing a few boards over the stream as a shelter or cover.

It will be observed that before spawning, the fish appear to have lost all inclination to feed, and there will be no difficulty in catching them by means of a net. It is advisable to have two tubs filled with water, and to place the males in one tub and the females in another. The sexes can easily be distinguished, because upon gentle handling, if the fish are ripe, a little milt or a few ova are sure to be emitted.

The spawning pans must be ready, and perfectly dry. Gently take out of the water a female fish, and grasp the head securely with the left hand, while your assistant keeps the tail in position. With the thumb and finger of right hand gently press out the eggs, working towards the vent, allowing the eggs to fall into one of the pans. If there is any difficulty in passing them, allow the fish to go and try another. Any undue pressure will not only kill the fish but render the eggs totally unfit for use.

The male fish must now be quickly taken out and operated upon in the same way, allowing the milt to run over the eggs in the pan; the two should then be mixed thoroughly together, and in about a minute a little water may be added, and the two again incorporated. They must be allowed to remain for not less than thirty minutes, the whole operation being performed as quickly as possible. The eggs must then be placed perfectly clean in a can partly filled with water, and be transferred to the hatching trays.

This is termed the dry system of spawning, and was the invention of M. Vraski, a Russian gentleman. The old method was to place water in the pan before stripping the fish; as the eggs soon lose their absorbing power in the water, and spermatozoa only live about two minutes in water, it can be readily understood the percentage of loss in the old plan was infinitely larger than in the new, which if skilfully performed only entails a loss of about 5 per cent.

In natural spawning not one egg in a thousand reaches maturity.

A fair average number of eggs in each female fish is 1000 to every lb. weight.

After the first day an impregnated egg may be readily distinguished from an unimpregnated one by a small annular disk on the top of the egg, which remains until it turns white.

THE CULTIVATION OF COARSE FISHES.

THE measures by which our food fishes can best be multiplied have received the attention and consideration of mankind from the earliest periods of time.

The first attempts at breeding, rearing, and cultivating fish were made by the Chinese, and can be traced back to periods of the greatest antiquity. The study of this matter at that time was a national source of wealth, and proved of the greatest value in the supply of daily food and in relieving distress in time of famine.

The Romans, too, spent large sums of money in the culture of fish, and the construction of fish ponds and lakes. During the middle ages, pisciculture had many patrons, and the monks contributed in no small degree to its success. It presented them with the means of food during their religious feasts and ordinances.

Although means have been adopted for the artificial propagation of Salmonidæ during comparatively modern periods, we are devoid of any reliable data as to practical endeavours in this country to cultivate any of our national coarse fishes for the purpose of restocking our depleted rivers and food-producing acres.

The science of fish culture is now, at all events, no longer a question of experiment based on scientific results, but one of national economy in the production of a cheap and wholesome aliment for our densely-populated cities and manufacturing towns, and in this respect we are bound to consider the science.

The laws affecting the harmony of nature are governed not only in view of the countless dangers fishes in their

embryo and alevin condition have to encounter, before being able to contribute to the reproduction of species, but also to the innumerable difficulties attending the fecundity of the eggs in their natural condition.

The direct contact of the milt with the ova is of course necessary to create the development of the germ. Eggs, therefore, failing to receive this impregnation, soon decompose in ordinary or natural spawning, and a very high percentage of loss may, from the above cause, be anticipated.

After the eggs are hatched, the enemies that prey upon the young are very numerous, and fish have to contend against almost innumerable difficulties before they are able to take their place in the repopulation of our waters.

The species of our national coarse fish best adapted for cultivation must be well considered, and I would suggest the following as being the best calculated not only to give sport to the angler, but to furnish food for the people, viz., pike, perch, carp, roach, tench, bream, dace, eels, rudd, &c. These may be divided into carnivorous and herbivorous feeders, and an undue increase of the former will, in the ordinary law of nature, present a corresponding decrease in the latter. To meet this, we find a greater fecundity is given to herbivorous fish than to their carnivorous *confrères;* while the latter in their turn prevent a too great increase over the former; so is the balance of nature preserved. In considering the question of the restocking of rivers, this feature must not be lost sight of, that as food fishes most of the carnivorous species are infinitely superior to the herbivorous; great care must be exercised in selecting a fair proportion of each species in order to retain an equitable balance.

The spawning of British coarse fishes varies from the Salmonidæ in this respect; whereas the latter shed their ova in the winter free or non-adhesive on gravelly bottoms of streams, the latter yield their eggs in the spring or summer months, and are adhesive in character, selecting stones, trunks of trees, weeds, rushes, &c., upon which to

attach their eggs. They delight in moderately still waters and select shallows for the better incubation of their eggs, also on account of the minute insectile life found therein for the young fish to feed upon, when hatched.

In considering the question of propagation, I have endeavoured to show that the natural enemies of our fishes are multitudinous, not only in their ovum and embryo stages, but also in their alevin condition, and measures should therefore be adopted as far as possible to guard against the difficulties that are known to exist in carrying out a scheme for the cultivation of our coarse fishes.

Experiments have been made in the artificial fecundation of the eggs of coarse fish, and apparatus of different kinds have been constructed for the hatching of adhesive ova upon wooden frames. I have myself designed an apparatus in which fish may be placed to spawn, after which the ova can either be left to hatch in the natural course, or removed to distant waters.

The structure is oblong in form, the length being about 5 feet, the width 2 feet 6 inches, and the depth 2 feet. The outer frame-work has strips of perforated zinc inserted, 3 inches in width, for the free passage of the water. In the centre of the box is a division for the purpose of separating the species, if desired. Round the interior of the box, including the bottom, are provided light frames, upon which is stretched galvanised netting of 1½ in. mesh; into this netting is intertwined young fir branches, and a lid formed with galvanised wire-netting closes the whole of the apparatus, and it is ready for use.

Previous to spawning the box is secured on the margin of a lake, small tributary, or other approved position; a few pairs of carefully selected ripe fish are then placed in the box, and in due course the spawn is deposited on the fir branches. If it is intended to stock the water in which the box is situated, it is simply retained *in situ* until the young fish are hatched; a small door in the side is then removed, and in due course the fish find their way into the waters; but supposing the intention is to transfer the eggs

to a distant part of the country, the frames are then drawn out with the fir branches and deposited spawn, and placed in a carrier filled with water and forwarded to their ultimate destination. The frames are taken out and sunk in the new waters until the eggs are hatched. The whole of the wood-work used in the construction is charred to prevent fungoid growth. In Sweden, for more than a century, there has been a similar apparatus in partial use, known as the "Lund" hatching box.

It is difficult to lay down a hard and fast rule as to the number of fish to be placed in a given area of water. As it is with pastures, so it is with waters: some are rich and productive in the extreme in supplying nourishing food, whereas in other instances the opposite we find to be the case. Broadly speaking, every care must be exercised by a frequent examination of the condition of the fishes, to avoid over-crowding; it will be far better to err on the side of over-caution in this respect, than heedlessly to stock the waters with a superabundance of fishes that would only result in a supply of lean, starved, and ill-formed fish, neither fit for the rod or the table. Suitable food should be given at regular intervals, avoiding large quantities at a time, which would only sink to the bottom and soon decompose, causing fungoid growth to the inhabitants of the waters.

The best food for our coarse fishes generally is large and small lob worms, brewers' grains, meal, oil-cake, &c., cut to sizes according to the age of the fish. The warmer the weather the fleeter the water to distribute the food, and the colder the weather the deeper must be the feeding. Very young fish only feed on minute insects, which may be encouraged by placing in the water newly made hay or old grass.

THE ACCLIMATISATION OF FOREIGN FOOD FISHES.

THE acclimatisation of fish is, it may be stated in commencing an article on that subject, the distribution of fish from one district to another, and the retention of life in those fish when they have been removed to a lake, river, or other water, in which they did not previously exist.

In order to be able to accomplish this important matter successfully, the first study must be the selection of waters resembling as far as possible those from which the fish were taken in the first instance, and to provide them with food similar to that which they obtained in their natural waters. Again, in order to render acclimatisation a success large-sized fish should be avoided, and those known as "yearlings" should only be chosen for the purpose of removal. Where practicable, however, it is better to transport the ova, and in proof of the advisability of taking this course, the introduction of salmon to Australia, of trout into many European rivers and lakes, and of carp to America, may be instanced.

Pisciculture has very properly been called the agriculture of waters, and we may expect to reap the same advantages by a judicious acclimatisation of carefully selected fishes as the farmer has in the past by a study of the same subject in relation to crops, &c.

I have always recommended that the premier consideration should be how we can best improve our own national fishes, before attempting to introduce foreign ones into our waters, and how with the greatest amount of caution we

can select species not detrimental to those which are indigenous.

We have, in Great Britain, vast areas of water entirely neglected, which would, under proper treatment, produce a grand and almost inexhaustible food supply to the people. Many of our rivers are well adapted for the introduction of anadromous fishes, and present excellent spawning-grounds, and the small tributaries are well stocked with suitable food for the young. If, therefore, salmon and trout of selected species were acclimatised therein, we should no longer find these fishes a luxury to the few, but a cheap source of food for the people.

The introduction of the Rhine salmon would be advisable, for it is generally admitted to be one of the finest of our Salmonidæ. With great advantage, too, a cross might be attempted between the Rhine salmon and that of the Tay.

The *Salmo quinnat*, or California salmon, must not be overlooked, for it is the most productive of all migratory fishes, thriving well in varied temperatures of water, and having extraordinary vital powers. Arguments have been advanced against their acclimatistaion into Great Britain on account of the high rate of mortality known to exist among them; but the difficulties and dangers they have to encounter in traversing the miles of rivers before reaching their spawning grounds do not appear in this country.

A new and important industry in canned and preserved fish may be anticipated in this country by the introduction of this species of fish into our rivers, many of which are well adapted for their reception.

The newly-discovered land-locked salmon next deserve attention. This species commends itself as possessing all the sporting attributes of the migratory salmon. It would prove invaluable in some of our rivers, lochs and lakes which are severed from the sea by various causes.

Much has been written against the introduction and rearing of hybrids, and the question as to whether the cross between the salmon and the trout will reproduce is still a disputed problem. Be that as it may, this fact remains

unchallenged, that the progeny of the *S. salar* and the *S. ferox* are well worth the attention of the fish culturist ; and the marvellous rapidity of growth they are known to make in a short period of time, and the ease with which they can be acclimatised, must commend them to us as fish of great economic value.

In hybridising salmon with lake trout all inclination to migrate ceases ; a class of fish may therefore be produced useful in ornamental waters and lakes, or rivers having no direct communication with the ocean. In making experiments of this nature, we have the advantage of producing a class of fish that are very rapid growers and flesh producers. In this respect they bear an affinity with hybridised animals, and the stock can always be replenished by the assistance of fish culture.

In offering suggestions upon the acclimatisation of trout, the fish must first be classified into two species : the non-migratory and the migratory. The *S. levenensis* has with success been introduced in large numbers into English rivers and waters, and I found in Norfolk, that fish of this species hatched off in February attained the unprecedented size of $7\frac{1}{4}$ inches in October.

Another non-migratory fish is the *S. ferox*, or great lake trout of Switzerland, which will be found to be easy of cultivation in this country, and whose eggs can be imported into Great Britain in large numbers. The fry are very hardy, and there is no difficulty in hatching them.

Many of our lakes and broads in Norfolk might be set aside for this purpose.

A great deal has been written in favour of the *S. fontinalis*, or Brook Trout of America. I have turned fry and yearling fish into several tributaries, but they have never again been seen or heard of, and many fish culturists have given up breeding them on account of their migratory propensities.

The cultivation of the *fontinalis* might, however, be attempted with advantage in enclosed waters having regular feeding and a plentiful supply of clear running water. For

ornamental purposes this species are not to be equalled ; but in stocking public waters they cannot be recommended, on account of their great love for migration.

The next fish of economic value, suitable for acclimatisation is the *Cyprinus carpio* of the *Cyprinidæ* family. The culture of this fish in Europe dates back to the eleventh century, when it was introduced from Central Asia. The particular species recommended for acclimatisation, as food producers, are the *Cyprinus carpio specularis*, or the Mirror Carp ; the *Cyprinus carpio coriaceus sivenudus*, or the Leather Carp, deriving its name from its peculiar voidance of scales, but having a beautiful soft thick skin.

The carp is a hybernating fish, and like other members of the *Cyprinidæ* family is an adherent spawner. It is well adapted for artificial culture, and can with ease be acclimatised to waters in this country and to artificial ponds and lakes. It is a very rapid grower, and will attain the weight of 3 lbs. in as many years, but its particular specialty consists in its delicacy as a food fish. It is estimated that a 4 lb. carp will yield 400,000 ova.

We have in this country many thousands of acres of land partially covered with water, and which, for agricultural purposes, are valueless. I strongly recommend that these waste districts should be utilised and brought into profit for carp culture. Our English and Irish farmers should be educated to the fact that under proper treatment land may be alternated for *aqua*-cultural as well as agricultural use ; and to be enabled to distribute a cheap and delicious food fish of this nature throughout the country must in itself form an act of acclimatisation of the greatest possible service.

Many years ago an industry was carried on in this country in cultivating the shad. If, therefore, this fish can again be acclimatised into our waters, great benefit would accrue therefrom. It will be remembered, before London sewage assumed its present gigantic proportions, that the Thames abounded with shad, as history informs us, at " Shad "-thames and " Shad "-well.

A great trade is carried on in America at present with the shad, and it forms one of the most important fisheries of that continent.

Another very valuable food fish I recommend for acclimatisation is the Black Bass of Canada (*Micropterus Dolomieu*). This fish is well adapted for stocking many of our fresh waters, and would be very useful for sporting and economic purposes.

Another fish well adapted for acclimatisation purposes is the Golden Tench or Gold Schlei. This was first introduced into England in 1867 from Upper Silesia, where it is cultivated in great numbers. This fish thrives best in ponds with an ample supply of weeds, upon which the spawn is usually deposited. It is a hybernating fish, and only attains growth during the summer months.

Great attention should be given to the subject of improving our national coarse fishes, and I can hardly conceive any act of acclimatisation more beneficial to the nation than the introduction of our Norfolk strains of roach, perch, pike, tench, &c., into some of the depleted rivers of our large cities and manufacturing towns. Again, a vast and profitable field is open to the national economist in stocking the miles and miles of canals that intersect our inland counties. There can be no practical difficulty in rendering these waters, so to speak, arterial sources of food supply to the people.

The science of acclimatisation might profitably be devoted to a more extended cultivation of mussels along the foreshores of our estuaries and rivers, which could be laid down with great advantage, not only in providing a cheap description of food for the people, but also in supplying bait for the long-line fisheries, and in this respect aiding the production of an important element of our deep-sea fisheries. With very great pecuniary advantages, too, the French system of laying down beds for the cultivation of the mussel by posts and wicker-work might be introduced. The mussel particularly recommended for acclimatisation is there known as the great mussel, which is

extensively used in Newfoundland in connection with the cod fisheries.

Another fish that would answer well for introduction in this country is the Murray Cod (*Grystes macquariensis*) from Australia ; an attempt was made several years ago, but the experiment was not a success. It grows to 60 lbs. weight, and the flesh is considered well adapted for food.

There are many rivers in England that are not suitable for the cultivation of salmon or trout, but which from the sluggishness of the waters are singularly adapted to the Murray Cod.

HINTS ON THE CONSTRUCTION AND MANAGEMENT OF FISH PONDS.

THE science of fish pond construction was a matter of considerable study in the middle ages, and a few instructive works are handed down to us, proving that the monks and country squires of old were no mean engineers in this direction.

It is a lamentable fact to find, after so much time and trouble have been devoted to the science, combined with a large expenditure of capital, that these valuable stew ponds are allowed to fall into disuse.

We know the object of these constructions, in the first instance, was to supply food to the monks and religious houses during their fasts and ordinances, and to preserve to the inhabitants of the old "Manor Houses" an easy means of adding a wholesome food to their dinner tables, on account of the difficulty in those days of obtaining wholesome sea fish in the heart of the country.

The principle I advocate for the construction of new fish ponds is the "series" system, which has been found so successful, and has fulfilled all reasonable anticipations; viz., nursery ponds, yearling ponds, stock ponds, or fattening ponds.

In selecting a favourable site, choice should be given if possible to sloping ground, in order that the water may flow from one pond to the other.

The nursery pond should be shallow; provided the natural soil is not gravel, this material should be added over the whole surface to a depth or thickness of six inches; the width should be three feet at the bottom, and about six

feet at the top, and the length in accordance with local requirements; but fifty feet may be taken as a fair medium length; there should be a depth of water at one end of six inches, and at the other ten inches; a few drain pipes should be placed at the bottom for shelters or hides, and weeds may be planted in places.

At the deeper end a sluice must be constructed, by means of which the water is drawn off to the yearling pond which lies below.

A "receiver" should be formed close to the sluice, five feet in length and one foot deeper than the other part, in which to catch the young fish. A sheet of perforated zinc must be placed across the sluice at an angle of 45°, so that when the water is being drawn off no fish will be suffered to escape.

Two, three, or more nursery ponds should be provided similar to the above, as great advantage will be gained therefrom, when the fish require sorting into sizes at the end of the year or during the first summer.

The yearling ponds must be much larger, and gravel must be placed in patches. The form of the pond can be irregular, as fancy or the contour of the land admits.

The depth of the water should be six inches at one end and about two feet at the other. Drain pipes may be laid about the bottom, and weeds planted to serve as hiding spots for the young fish. A ditch about three feet wide should be formed in the centre of the pond, leading to a receiver constructed close to the sluice; overhanging bushes must be planted round the banks in some places, for shelter in very hot weather.

The stock or fattening ponds must be constructed in a similar manner to the yearling ponds, but must be much larger. The water should not be over a depth of three feet, and the pond should be provided with holes here and there of about six feet deep. Shallows must also be designed about one foot in depth. I advise small tributaries or side brooks being designed, with a depth of eighteen inches of water, well stocked with aquatic plants.

Great care must be exercised to adopt the same principle laid down in describing the yearling ponds, as to having ditches and "receivers" leading to the sluice. Patches of gravel, too, must not be neglected, together with stumps of trees, large stones, and aquatic plants. I should recommend three stock ponds in alternate use, because no pond should be devoted to fish culture without change for a longer period than three years. The time of drawing off the water is in the autumn, and the fish should then be caught and disposed of as occasion may require. The bottom of the pond should be cleared out, and all the slime and mud removed. The pond should be dug or ploughed over, and allowed to stand all the winter to receive the frosts. In the spring it should be sown with oats, beetroots, or vegetables, and after the crop has been removed in the summer allow the water to re-enter, and fresh stock it with fish.

Another pond can be treated in the same way until the time comes round again in the third year for drawing off the first pond.

The more frequently a pond can be laid dry, the better for the growth of the fish. It will be found that three years is the utmost for this purpose.

By alternating *aqua*-culture with agriculture, results may be anticipated of the most satisfactory nature, for nothing tends more to the formation of lean, ill-flavoured fish, than keeping them in a pond that has not been cleaned out and exposed to the air.

The leading features in the construction of fish ponds are to make each pond independent of the other; to guard against floods; to have every portion under entire control; to be enabled to drain the water off by approved sluices, without a chance of killing the fish, the same being caught in the "receiver" which must be incapable of being drained to the bottom, always leaving a depth of 12 inches of water for the fish.

If the water to supply the ponds comes from small streams or rivulets, every exertion must be made to obtain

command of the head of the stream, in order to guard against any risk of the water being contaminated from various causes.

The construction of the sluices must also be a matter of great care. The overflow must be carried off at the top of the sluice, and not by doors opening at the bottom as in the usual way. By the plan advised above there is no fear of the pond flooding, for when the water reaches the standing level it runs over into the next pond.

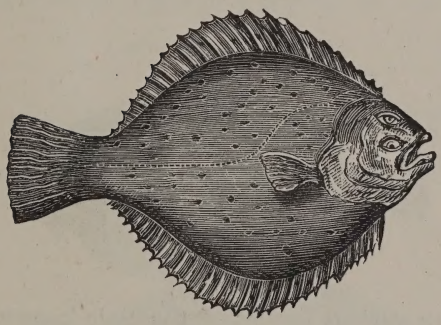
The level can be regulated at will by raising or lowering the door.

NATURAL HISTORY OF THE FISHES EXHIBITED IN THE TANKS.

Family PLEURONECTIDÆ.

THE TURBOT.

(*Rhombus maximus.*)



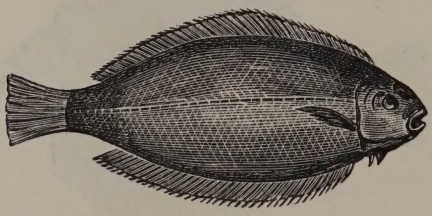
THE Turbot may very properly be considered the choicest member of the Pleuronectidæ family. The grounds most favourable for the production of large fish, and where they are taken in quantities, are the Great and Little Silver Pits, the Coal Pits, the Dowsing and Well Banks, and again on the Devon and Cornwall coasts, and in the English Channel. The Turbot is one of the most prolific of our food fishes, and sheds during the month of August no less than 14,000,000 eggs. These are adherent in their nature, and are spawned upon weeds, stones, &c., at the bottom of the sea. The Turbot is a great wanderer when in pursuit of food. This consists of small fish, crustaceans, &c. The average weight of the turbot is 10 lbs., but it attains as much as 30 lbs., and there are records of fish weighing as

much as 100 lbs. They are caught in the trawl net, worked from a vessel termed a smack or trawler. To give some idea of the value of this branch of our sea fisheries, it may be stated that at the present time there are 2,500 vessels engaged in trawling, each one of which has cost from £1000 to £1500. These vessels vary from 50 to 100 tons, and carry five hands. In addition to the above, there is a large fleet of screw steamers, of over 100 tons each, and costing between £3000 to £4000 each, which carry the fish from the fleet to the various ports.

Family PLEURONECTIDÆ.

THE SOLE.

(*Pleuronectes solea.*)



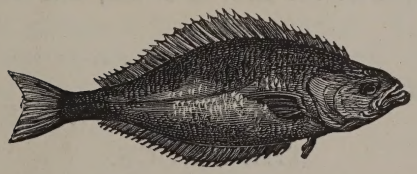
There are various species of the Sole known round our coast, and these may be classified in order of commercial merit as the Common Sole, the Lemon Sole, the Variegated Sole, and the Solenette. Some of the species present a smooth surface; in some we find rough or ciliated scales; some have spines in their anal fins and others are void of them. The Common Sole derives its name from the Greek words *pleura* (side) and *nekomai* (to swim)—conjointly a side swimmer. The Sole, being generally affected by spawning influences, frequents sandy grounds, where it covers itself up for protection from its enemies. In the winter the Sole hibernates for the sake of warmth. It is a ground feeder, and lives principally upon sand-worms, crustaceans, and minute testaceous animals. During the months of May and June the Sole is to be found in

estuaries and shallow waters, where it resorts for the purpose of spawning, after which it migrates or descends to deeper waters, and is caught by the trawl net in more or less quantities all round the coast of Great Britain and Ireland. The Sole sheds about 140,000 eggs. During the first few weeks of a young Sole's existence it swims on edge and has an eye on each side of the head, and as the fish increases in size the eye on the white or under side works round to the dark or upper side. The minute channel or score made by the eye in its process of evolution can be easily seen by the aid of a microscope. There is a vast preponderance of the female sex over that of the male, and the proportion may be taken at about 500 to 1. Perhaps there is no fish more difficult to obtain than a male Sole.

Family PLEURONECTIDÆ.

THE HALIBUT.

(*Pleuronectes hippoglossus.*)

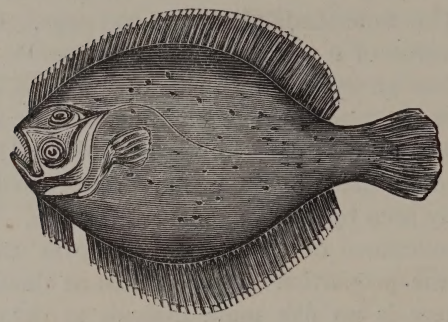


The Halibut is caught in the North Sea, and on the coasts of Norway, Iceland and Greenland. It contains a large quantity of oil, and considerable industry is carried on in this direction. The Halibut averages in length 4 to 5 feet, and in weight will frequently reach 300 lbs. and over. The fish spawns in March and April. It is caught by hook and line, by spear, and by the trawl net. The flesh is coarse in quality, the best portion being the head and fins. The Halibut is a ground feeder, and lives on small fish and crustaceans.

Family PLEURONECTIDÆ.

THE BRILL.

(*Rhombus vulgaris.*)

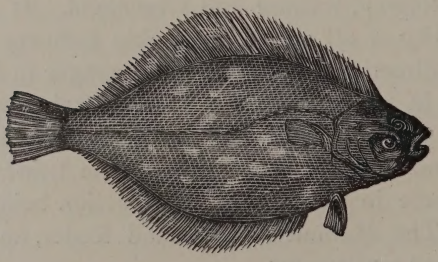


The Brill is a similar fish to the Turbot, but smaller in size and much inferior in quality. It is caught in the same localities as the Turbot, and by means of the trawl-net. The Brill is fond of sandy oozy ground. It spawns in the summer months on stones, weeds, &c., at the bottom of the sea. Its food consists of worms and small fish. An average weight of the Brill is 6 lbs., and its length 15 inches.

Family PLEURONECTIDÆ.

THE PLAICE.

(*Platessa vulgaris.*)



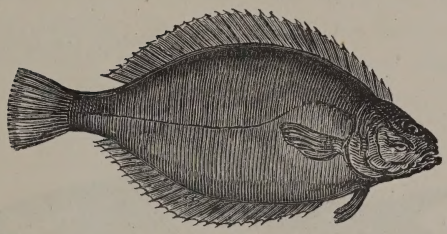
The Plaice is taken in the trawl-net, or by hook and line in abundance round our coasts. Its colour is a very clear

brown, the surface being studded with brilliant spots. The food consists of soft marine animals, young fish, and small crustaceans. The Plaice spawns in April and May, and frequents sandy and muddy shores.

Family PLEURONECTIDÆ.

THE FLOUNDER.

(*Platessa flesus.*)

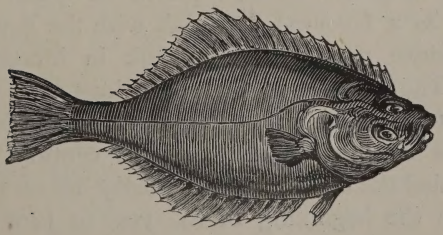


The Flounder frequents the estuaries and rivers round the coast, and will thrive in brackish or even fresh waters. It is not so large as the Plaice, and is considered the most common of all the flat fishes. The name is derived from the awkward motion it has in swimming. The Flounder feeds upon worms, small insects, and fishes. It spawns in February and March. Its average weight is about 2½ lbs., and its size about 7 inches.

Family PLEURONECTIDÆ.

THE COMMON DAB.

(*Platessa limanda.*)



The Dab takes its name from the Latin word *limanda* (*lima*, a file), on account of the rough surface presented by the scales. It frequents the sandy parts of the coast, where it is caught in large quantities. The food resembles that of other members of the same family. It spawns in May. The Dab is caught in the trawl-net and can be captured by hook and line. The length of the fish is about 10 inches, and its weight 2 lbs.

Family CLUPEIDÆ.

THE HERRING.

(*Clupea harengus.*)

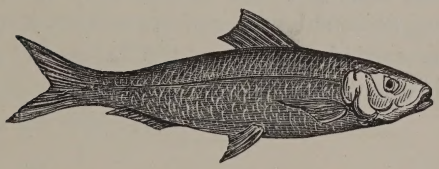
The name of the Herring is derived from the German "Heer," signifying an army. The Herring is a migratory fish, and visits the various waters round our coast at stated seasons of the year. In the months of August, September and October, it approaches the east coast of England, for the purpose of shedding its spawn, but in the Firth of Forth it spawns in March. The eggs are adhesive in character, and are deposited on weeds, stones, &c., at the bottom of the sea. An average yield may be taken to be 50,000 eggs for each fish. As an article of food the Herring has held an important position in the economy of nations from the earliest period of time. It was recognised as a favoured food fish with the Romans, and has ever since maintained its rank in increasing proportions. The exact date when Herrings were first cured with salt is unknown, although mention is made of salted herrings as far back as the twelfth century. At the present period the chief seats of industry are on the Scotch coasts, from the beginning of the year to June and July.

The North Sea fishing is followed by what is known as the Home fishing, the centres of which are at Yarmouth and Lowestoft on the east coast, and this continues into December. The Herring swims in shoals of three to four miles in length and 100 ft. in depth. A take of fish is measured by the last,—of nominally 10,000 fish to a last, but in reality 13,200 fish, as 132 fish are given to the 100. To give an idea of the vast importance of the Herring fishery to this country, it may be stated that we have over 30,000 vessels engaged in the trade, which are manned by over 100,000 hands. In addition to this there are several hundred thousand more persons engaged directly and indirectly in this branch of the sea fisheries.

Family CLUPEIDÆ.

THE PILCHARD.

(*Clupea pilchardus.*)

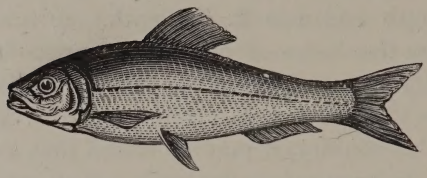


The Pilchard very closely resembles the Herring in appearance, but upon examination it will be noticed that the dorsal fin is placed in the centre of gravity of the fish, whereas with the Herring it is a little nearer the tail. The principal seat of the fishery of Pilchard is off the coast of Cornwall, from the beginning of August to the end of the year. They are caught in seine-nets, and are chiefly sent to Roman Catholic countries. The take of Pilchards is measured by the hogshead of 3000 fish, winter fish not quite so many. They spawn in April and May, and shed about 600,000 eggs. Their food is similar in character to the Herring—namely crustaceans, spawn, &c.

Family CLUPEIDÆ.

THE SHAD.

(*Clupea Alosa.*)



This fish has been classified into three varieties—the Twaite Shad, the Allice Shad, and the Scale-finned Shad. The species can be recognised on account of the first named having a row of teeth on both jaws and spots along the sides. In the Allice Shad is a deep notch in the centre of the upper jaw. The food of the Shad resembles other species of the genus Clupea. The fishing is carried on from April to August, in estuaries at the entrance of the rivers Severn, Wye, &c., where they ascend for the purpose of spawning in the month of July. Before the Thames was poisoned with sewage matter, a considerable industry was carried on there, as the names of "Shad"-well and "Shad"-thames imply.

Family CLUPEIDÆ.

THE WHITEBAIT.

(*Clupea alba.*)

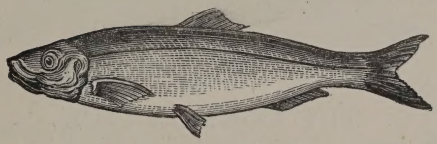
Whitebait abound in most of our estuaries, but the principal industry is in connection with the Thames, and the famous Whitebait dinners at Greenwich and Blackwall have now become one of our National Institutions. The fishing for Whitebait is carried on by stow-nets and seines,

from March to the autumn months, and during the summer immense quantities are caught. It has been proved beyond doubt that in fishing for Whitebait, the fry of other and valuable species of fish are annually caught in destructive quantities. This is an important fact, and is worthy of very careful consideration from the authorities.

Family CLUPEIDÆ.

THE SPRAT.

(*Clupea sprattus.*)

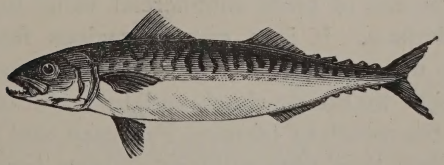


The Sprat is caught in the bays and estuaries round our coast in large quantities, by means of seines or sprat-nets. So prolific are the fish in numbers, that the catches are frequently devoted to the purposes of manure. The Sprat spawns in October. The fish has often been confused with the Herring, but upon a close examination the generic characters are found to be widely different.

Family SCOMBERIDÆ.

MACKEREL.

(*Scomber scomber.*)



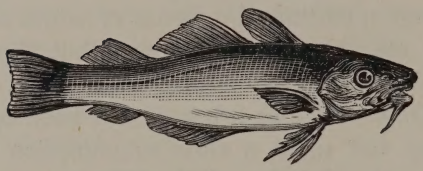
The Mackerel is remarkable for its great elegance of form, and for the richly blended colours with which it is decorated. The scales are small and smooth. By the

usual law of nature, the fish leave the deep water and frequent the shallows in vast quantities to spawn in the month of June. As many as 540,000 ova have been counted in the ovaries of a single fish. The eggs are shed at the surface of the sea, and remain floating until they are hatched. Mackerel are voracious feeders; their food consists of crustaceans, and the fry and spawn of other fish. The fish has one row of conical teeth in each jaw. Mackerel are caught from January to August, by means of drift-nets, seines, and railing. The take is calculated by boxes of 50 to each box. The Mackerel fishery round our coasts has become an important industry.

Family GADIDÆ.

THE COMMON COD.

(*Gadus morrhua.*)



The varieties of the Cod are numerous. A few of the species have been introduced into the tanks at South Kensington. The common Cod frequents our coast more or less in large quantities, and provides a very extensive and valuable industry at Great Grimsby and Hull for several thousands of fishermen and others engaged in the trade. It is also of great commercial value in producing oil and isinglass. It is a most voracious feeder, living principally upon worms, crustaceans, and herrings. The Cod is caught by the trawl-net, and by hook and line. It spawns in the month of January, February, and March, and yields no less than nine millions of eggs, equal to about the number of cod fish annually brought to our markets. The eggs are free or non-adhesive in character, and are shed close to the surface, in which floating position they

remain until hatched. The mouth of the Cod is armed with a broad band of teeth on the upper jaw which is the longest. There is a narrower band on the lower jaw, and from its chin is pendant an elongated barbule.

Family GADIDÆ.

HADDOCK.

(*Gadus æglefinus.*)

The Haddock frequents the shores of Great Britain and Ireland in large quantities, but is not to be found in the Baltic or the Mediterranean. The fish swim in shoals, and are generally caught by the trawl net, and hook and line. Haddocks spawn in the months of February, March, and April. Their food principally consists of crustaceans and the young of other fish. Two very peculiar patches are to be found on the shoulders, which have given it the appellation of the "Sacred Fish," in allusion to the impression made by St. Peter with his finger and thumb when he performed the miracle of the tribute money. The migration of the Haddock since those days is remarkable, as these fish have entirely disappeared from the waters where the miracle was performed.

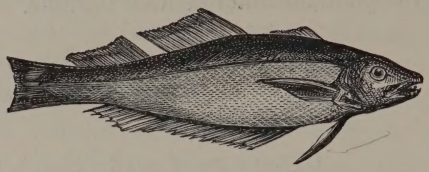
Family GADIDÆ.

WHITING.

(*Gadus merlangus.*)

The Whiting is a very delicate flavoured fish, and is caught in great abundance round our coasts. It approaches the shore to spawn in the months of January and February.

Like other members of the Gadus family it is a very voracious feeder, its chief food being crustaceans and the fry of fish. Its mouth is wide, and is armed with one row

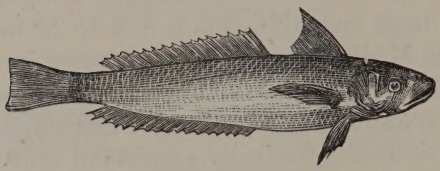


of large teeth on the outer edge, and several rows of small teeth inside. The upper jaw protrudes in front of the lower.

Family GADIDÆ.

THE HAKE.

(*Merlucius vulgaris.*)



The Hake is found on the south and south-west coasts of England, and is plentiful off the coasts of Ireland. It is caught at the bottom in trawl-nets, and also by seines, and hook and line. The time of spawning is in the first three or four months in the year. The head is long, broad and flat: the mouth is studded with a row of slender teeth in each jaw, the lower jaw is the longest. The Hake is an exceedingly voracious fish, as its name *Merlucius* (Sea-pike) implies.

Family STURIONIDÆ.

THE STURGEON.

(*Acipenser sturio.*)

The common Sturgeon frequents the estuaries of our large rivers, where it is occasionally caught when spawning

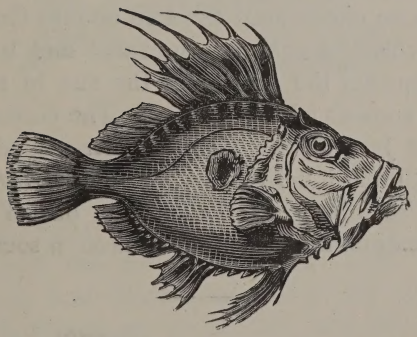
in the winter. Its favourite haunts are in deep water. The Sturgeon has a strange tubular-shaped mouth, placed under its long head, and is void of teeth. It sucks into its mouth the worms and other soft substances to be found at

the bottom of the sea. Its nose is long and somewhat the shape of a mole, and is provided with cirri, like other fish that live by routing. The Sturgeon has been named the Royal fish, because by an unrepealed Act of Parliament all Sturgeon caught within a certain limit are the property of the King. It is said these fish were reserved exclusively for the table of King Henry I.

Family SCOMBERIDÆ.

THE DORY.

(*Zeus faber.*)



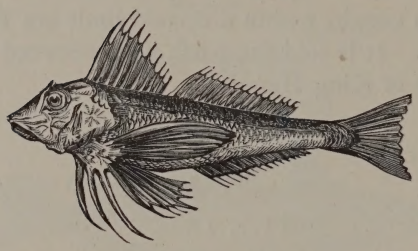
This fish contends with the Haddock in the honour of having the impress of the Apostle's fingers on the side. The oval-impressed shape of the body is singular. From the voidance of scales the surface of the fish is smooth and the reflected colours are very handsome. The Dory, when cooked, is held in great repute for its delicate quality. It

spawns in December. The fish is caught by the trawl, seine, hook and line. Its mouth is capable of great protrusion, and is armed with a row of teeth on each jaw. The spines on the dorsal fin are very long, ending in a filament. The Dory was held in great regard by the ancients, who named it Zeus or Jupiter.

Family SCLEROGENIDÆ.

THE RED GURNARD.

(*Trigla cuculus.*)



There are several species of the Gurnards, two of which are common on our coasts,—the Red and the Grey Gurnard. This fish is chiefly caught by the trawl and by hook and line. It frequents the bottom of the sea in search of its food, which consists of crustaceans. The Gurnard spawns in May and June, in the shallow waters round our coast. The Red Gurnard derives its name (*cuculus*) from the peculiar noise it makes when taken out of the water, somewhat resembling that of the cuckoo in sound.

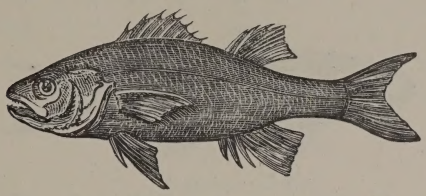
Family PERCIDÆ.

BASS OR SEA PERCH.

(*Perca labrax.*)

The Bass is a well-proportioned fish, and differs from the River Perch by the coloured bars on the back and sides. This fish is to be found along the south and west coasts.

It swims in shoals, and deposits its spawn in the summer at the entrances to harbours. It lives on crustaceans and the fry of other fish. The Bass is caught by hook and line,

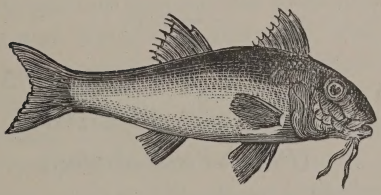


and by seines and trawls. It was known to the ancients, who held it in great regard. The Romans called it *Lupus* (a wolf), in allusion to its voracity.

Family PERCIDÆ.

STRIPED RED MULLET.

(*Mullus surmuletus.*)



This fish is very striking in appearance; its head approaches to a vertical line, and it has teeth on the lower jaw and palate only. Near the mouth are two cirri, which no doubt assist the fish in search of food. There are two species of Red Mullet known in this country, the striped Red Mullet or Surmullet, and the plain Red Mullet (*Mullus barbatus*). It frequents the south coast, where it is caught in the trawl, drift, and seine-nets. The Red Mullet spawns in the spring, and feeds on very soft crustaceans.

Family MUGILIDÆ.

THE GREY MULLET.

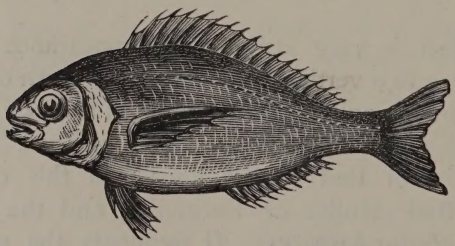
(*Mugil capito.*)

The Grey Mullet frequents shallow bays, creeks, tidal rivers and harbours, especially on the south coast, and spawns in June and July. It is a most delicate fish, and is held in high esteem. The Grey Mullet is exceedingly difficult to catch, having a most remarkable instinct for escaping from danger. Its teeth are very small, and of no service in self-defence. Its food is composed of soft vegetable slimy substances, and occasionally worms. The fish is caught by hook and line, and by seine-nets.

Family SPARIDÆ.

THE SEA BREAM.

(*Pagellus centrodontus.*)



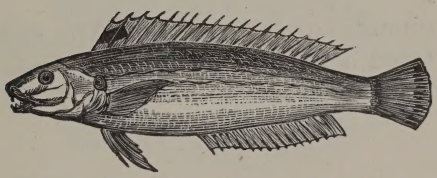
There are several species of the Sea Breams which frequent our coasts in abundance, and spawn in the winter. The young are known as Chads. The food of the Sea Bream consists of crustaceans, the fry of other fish, and vegetable substances. It is one of the most voracious of

marine fishes, as a glance at its mouth will at once prove. The formidable row of teeth in the Gilthead Bream are singularly qualified to crush up shells of the hardest nature. The average length of the fish is about 12 inches, and the weight 7 lbs.

Family LABRIDÆ.

THE WRASS.

(*Labrus Julis.*)



There are several species of the Wrasses in this country. This fish frequents the rocky parts of the coast, where it can be found in great numbers. The Wrass spawns in the spring in the shallow parts of the coast ; its food consists of crustaceous and testaceous animals. The mouth of the Wrass is very remarkable, and is fitted with a sort of telescopic apparatus, by means of which it has the power to draw in its food. The mouth and gullet are armed with a formidable quantity of teeth. The most striking feature in the various species of the Wrass is the beautiful colouring that decorates its sides ; but this soon disappears when the fish is removed from the water.

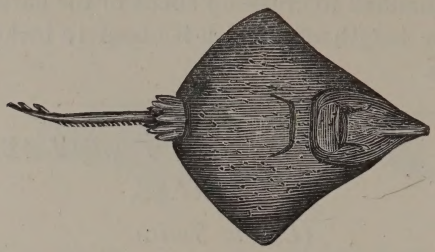
Family RAIIDÆ.

THE SKATE.

(*Raia batis.*)

There are various species of the Skate resembling each other in the principal features. As an article of food the skate is of a common and coarse description. It is captured by the trawl-net, and by hook and line all round our coast.

It attains a weight, upon an average, of 20 lbs., but many are caught in excess of this weight. The Skate lays

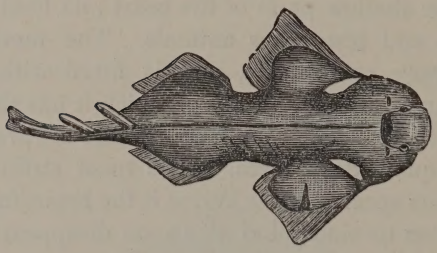


during the summer only 5 to 7 eggs. The egg shells are frequently found along the sea shore, and are known as Shepherd's purses."

Family SQUALIDÆ.

THE MONK-FISH.

(*Squatina Angelus.*)



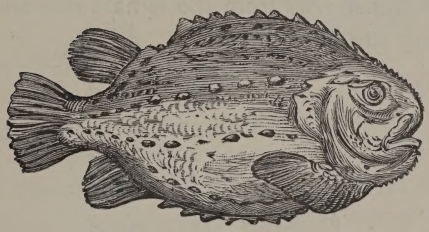
The Monk-fish is also known as the Angel-fish and Shark Ray. It takes its name from the peculiar form of the head, which is as if arrayed with a monk's hood, and also from the extended pectoral fins, resembling in appearance the wings of an angel. The Monk-fish is very common round the south and east coasts of this country. It is a voracious feeder. It has the power of covering itself up with the sand and mud, similar to the Angler-fish. The Monk-fish attains the length of 6 or 7 feet, has a powerful smell of ammonia, and in colour resembles the soil of the

locality where it lives. The female produces its young alive during the summer months.

Family CYCLOPTERIDÆ.

THE LUMP-FISH.

(*Cyclopterus lumpus.*)

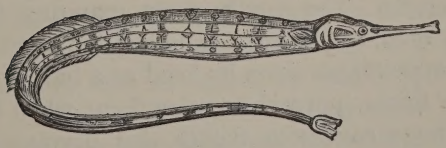


The Lump-fish is very awkward and unwieldly, and when swimming has a most grotesque appearance, the motive power being given with its tail. The spawning season is the months of March and April, when the colours of the fish are very intense and brilliant. Its food consists of young fish. The Lump-fish has a very peculiar piece of mechanism under its chin, by which it has the power to attach or anchor itself to stones and other substances at the bottom of the sea.

Family SYNGNATHIDÆ.

THE GREAT PIPE-FISH.

(*Syngnathus acus.*)



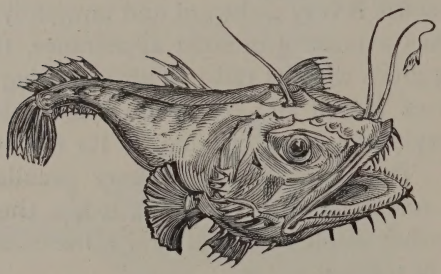
There are several species of the Pipe-fishes, the principal being the Great Pipe, the Deep-nosed Pipe, and the Snake

Pipe. This interesting fish is to be found at the entrances to some of our large rivers, but it is never known to enter fresh water. The head of the Pipe-fish is a most interesting study, for the jaws are united and form a hollow tube or cylinder, through which it draws up its food. This consists of worms and water insects. The male fish has a very peculiar structure in the belly near the vent, namely two soft flaps which fold over and form a pouch into which the eggs are transferred from the female fish and remain *in situ* until they are hatched.

Family LOPHIIDÆ.

THE ANGLER-FISH.

(*Lophius piscatorius.*)

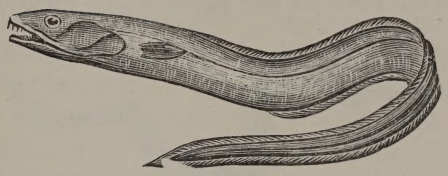


The Angler-fish is to be found round our coast in rather small quantities. It has very little power of locomotion, and therefore adopts other methods by which it can obtain food. The Angler is a most voracious feeder, and nothing appears to disturb its digestive organs (if any). Its food consists of live fish, pieces of wood, crustaceans, and other delicate morsels. The Angler when requiring food covers itself with mud, and then sets in motion the two shining elongated appendages upon its head as a bait or attraction; the smaller fishes approach to seize them, when the Angler opens its huge cavernous mouth, and devours the unfortunate intruders. As an article of food the Angler is not in high repute.

Family MURÆNIDÆ.

THE CONGER.

(*Conger vulgaris.*)



The Conger Eel resembles the common eel in most particulars, but the upper jaw is the longest. The fish is to be found in large quantities off the shores of the south coast and the Channel Islands. The power of the jaws is tremendous. They are armed with a row of teeth top and bottom, which enables the fish to eat almost any description of fish, especially crustaceans. Being averse to cold the Conger is found in deep waters during the winter months in a torpid condition, but in the summer it is to be caught nearer shore. It spawns in the winter and sheds about 15,000,000 eggs. The Conger grows to an enormous size—as much as 7 feet in length and 2 feet in circumference, and it frequently exceeds 100 lbs in weight. It often proves a formidable enemy when caught on a line.

Family MURÆNIDÆ.

THE EEL.

(*Anguilla vulgaris.*)

The general appearance of the Eel is well known, and requires little description. The body is covered with a thick mucous, and its mouth is studded with a row of teeth in each jaw. There are three or four species of the Eel in this country. Various methods are adopted in which to catch eels during their migrations to the sea in the autumn months, principally by fixed engines. The Eel is

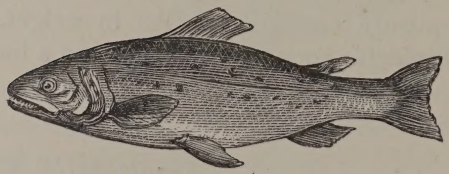
chiefly caught at night, and its powerful desire to migrate will often cause it to travel over land in long wet grass. The Eel has a very singular formation by which it is enabled to retain life longer than any other fish. This is a structure at the back of the pectoral fins which it fills with

water, and is thereby enabled to moisten its gills for a considerable period when out of water. The heart of the Eel is situated in the tail, the pulsations being very plain. During the cold months the Eel will bury itself a considerable distance in the mud.

Family SALMONIDÆ.

THE SALMON.

(*Salmo salar.*)



The Salmon has very properly been designated the King of Fishes. In its various stages of growth, from the egg to full maturity, it is honoured with a variety of names. Thus we have the Alevin, the Fry, the Parr, the Smolt, the Grilse, the Kelt and the Salmon. The Salmon is an anadromous fish—that is, it passes from the sea through brackish waters up into rivers and streams, for the purpose of shedding its spawn on gravel, and will average a yield of 800 eggs to every lb. weight. The fish then descends the rivers back to the sea in an unclean condition

and unfit for food, being then known as the Kelt. The eggs are hatched out in due course, and the fry have to contend against an innumerable series of dangers and difficulties. The growth of the fish from the fry stage to the Parr, and then to the Smolt, is very rapid, and its increase in weight is wonderful. There is no fixed rule for the first migration of the Salmon, and this entirely depends upon local circumstances. Some Smolts descend the first year, others the second, and some not even until the third year. It remains in the sea, upon an average, twelve months, and then returns to the river as Grilse. A remarkable law of nature teaches the fish to seek the identical river in which it was bred. The Salmon is a most voracious feeder, as a glance at its open mouth will prove. Its food consists of worms, marine animals, sand eels, and the fry of fish generally. The more abundant the food the greater is the percentage of growth; and from this arises the old adage: "The larger the river the bigger the fish." Much has been said and written about the Salmon disease, but the whole may be summed up in a similar remark, "The purer the water the cleaner the fish." Strange as it may appear, the Salmon does not feed (or but very little) in fresh water, but when in the sea it stores up a quantity of fat in its pyloric appendages which supplies it with a degree of nourishment upon which to subsist when in the rivers.

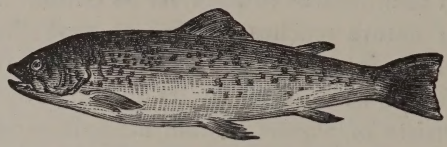
Family SALMONIDÆ.

THE TROUT.

(*Salmo fario.*)

There is a great variety in this branch of the Salmonidæ family, and this may be classified as migratory and non-migratory fish. In the first list we have the Bull Trout (*S. eriox*); the Salmon Trout (*S. trutta*); the common Trout (*S. fario*); and the American Brook Trout (*S. fontinalis*). Among the non-migratory Trout we find the

Great Lake Trout (*S. ferox*); Loch Leven Trout (*S. levenensis*); and the Hybrids between the Salmon and the Trout. The Trout, like its royal master, the Salmon, ascends the rivers into the tributaries and streams for the purpose of spawning during the months of October and November, and will yield 1000 eggs to every pound of its weight. The operation of spawning takes place on the gravelly bottoms, where the young fish are hatched out, the time being governed by temperature and other influences. The Trout is a most voracious feeder, living



chiefly upon the young of other fishes, worms, and flies of every description. Although we have several varieties of the Trout, and in general appearance there is a marked difference in them, the theory that has lately been advanced is gaining ground that only one species of Trout frequenting our rivers actually exist. If we take into consideration the influences produced by the various descriptions and quality of the food, of the water, of the soil in the river beds, and other like important distinctions, we cannot be surprised at the great variation in the fish themselves, both as to size and colour.

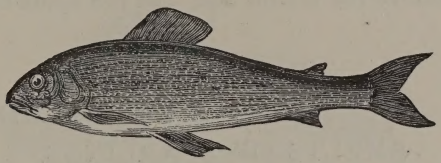
Family SALMONIDÆ.

THE GRAYLING.

(*Salmo thymallus.*)

The Grayling derives its name from the gray lines or dusky bars along the body, and from the word thyme, to which herb this fish bears an affinity as regards smell. It is very similar to the Trout in its habits, and thrives best in stony and gravelly bottoms. The Grayling spawns in

April and May, and in this respect differs from the Salmon and Trout, which spawns, as stated, in the winter. The food of the Grayling consists of flies and larvæ. It has a very large swimming bladder, which enables it to rise to the fly with great rapidity. The Grayling has been

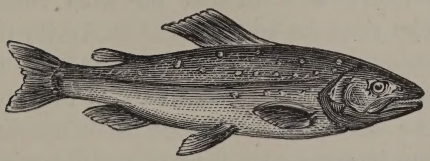


denominated the Queen of the Salmonidæ, and certainly one can hardly conceive a more perfect picture than a Grayling in full condition, immediately it is removed from the water, reflecting its lovely prismatic colours of gold, green, and blue.

Family SALMONIDÆ.

CHARR.

(*Salmo umbla.*)



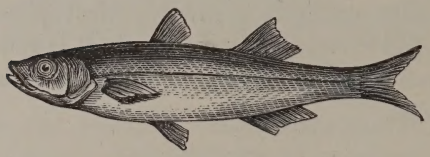
There are distinct species of the Charr in this country, those indigenous to the Welsh Lakes, and those to the English Lakes. The latter is to be found in Cumberland, Westmoreland, and Lancashire. The Red Charr spawns in February, other species select earlier months. The Charr occupies the deep parts of the lakes, and consequently rises but little to the fly. In the English Lakes it will average nine to fourteen inches in length, but in some instances it is larger, and with small fins. It is a well-proportioned handsome fish. The Welsh Charr is a shorter fish, not

more than six to seven inches in length, and with much larger fins. The colours of the Charr are exceedingly handsome, ranging from a dark rich brown on the back, to a rich olive green on the sides, and blending with a deep reddish orange on the belly; a few yellow-white spots are to be seen above the lateral line, and red spots below it.

Family SALMONIDÆ.

SMELTS OR SPARLINGS.

(*Osmerus eperlanus.*)

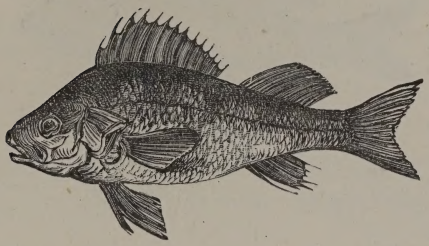


The Smelts fisheries are not numerous. In Scotland they are to be found, also on the east and west coasts of this country, and there is one at Brighton on the south coast. Before the days of the London Sewage a considerable industry was carried on with Smelts in the Thames. The time for spawning is in April; the eggs are yellow in colour and smaller than Salmon eggs. The Smelt inhabits fresh water from August to May, and then returns to the sea for the purpose of recuperation. It is very voracious, its food consisting of small fish, crustaceans, &c. The delicate flavour of the smelt renders it a fish of great request. It has a singular smell, closely resembling the cucumber, and is very powerful when first removed from the water. The fish grows to about seven inches in length, but has frequently been caught much longer. Although the smelt lives six months out of the twelve in the sea, it has often been acclimatized entirely to fresh-water ponds.

Family PERCIDÆ.

THE PERCH.

(*Perca fluviatilis.*)



The Perch can boast of a long and historical descent. It was well known and esteemed by the ancient Greeks and Romans. It is to be found in Scotland, in portions of Ireland, and in most of the waters of England. The Perch does not like sharp running rivers, but prefers water of a quieter nature. Its average weight is from one to two pounds. It is a carnivorous feeder, and prefers worms and insects and small fishes. The Perch is very plucky, and is most voracious. It spawns in April and May in shallow, weedy water, and the peculiar ribbon-like appearance of the spawn is very remarkable. The various tints presented in the sides of a Perch always arrest the eye. The fins are a very fine red, and perhaps it would be difficult to find more striking and beautiful colours; these have claimed the pencil of the artist for many generations past.

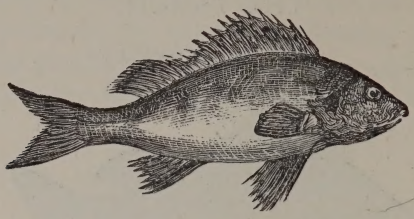
Family PERCIDÆ.

THE RUFFE.

(*Acerina vulgaris.*)

The Ruffe is very closely allied to the Perch, and it is to be found in large quantities in the river Yare in Norfolk,

and in the Thames. The length seldom exceeds six inches. Its habits are very similar to the Perch. The Ruffe is a

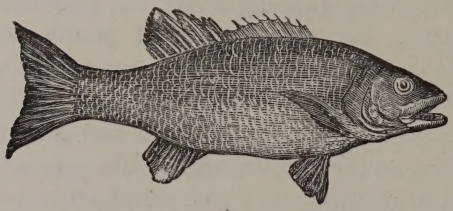


carnivorous feeder, and spawns in April in the weeds and roots of ditches leading out of the rivers.

Family PERCIDÆ.

BLACK BASS.

(*Micropterus Dolomieu.*)



This grand non-migratory fish is a native of the principal rivers and lakes of Canada and the United States of America, where it is found in abundance. There are two varieties of the Black Bass, the large mouth and the small mouth. The colour of this fish in the younger species is greenish-black or dark olive-green, darker on back, shading to yellowish-white on belly and underside lower jaw. The large mouth Black Bass (*Micropterus Salmonides*) is quickly distinguished from the former by its enormous mouth in comparison with the smaller fish, and from its colour generally being lighter in tint. They are exceedingly voracious, and will eat almost anything; a worm, minnow, fly or frogs, all appear on his bill of fare.

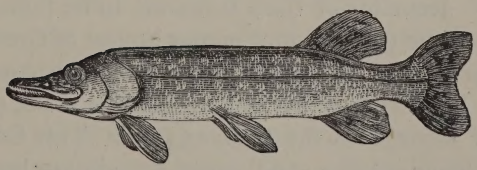
The Black Bass is an excellent sporting fish, and requires not only good tackle, but a skilled hand to land him. As a food fish it is held in the highest estimation, the flesh being considered a very great delicacy. It attains a weight of 10 lbs. and upwards, but the average is about 4 lbs. On the approach of the spawning season in May or June, the female fish prepares a nest by scooping out a hole in the ground or mud; these nests are circular in form varying from 1, 2, to 3 feet in diameter, according to the size of the fish. The parent fish takes the greatest care of its ova, and of its young when hatched, by swimming round the nests and keeping off all intruders. When the fry are able to swim they may be seen accompanied by one of the parent fish leading them in the same way as a hen does her chickens. The Black Bass prefers still water to sharp running streams.

*** *To the Marquis of Exeter this country is particularly indebted for his exertions in introducing this very valuable food-producing fish into England. In addition to the assistance received in the compilation of the above notes, his Lordship has kindly consented to contribute, later on, in the Journal of the Handbook, papers in detail on the large and small mouth varieties of the Black Bass.*

Family ESOCIDÆ.

PIKE.

(*Esox lucius.*)



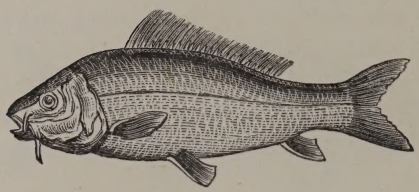
The Pike inhabits most of the rivers, lakes and broads of the United Kingdom. The date of its introduction is unknown, but reference is made to the fish as far back as

1382. In the reign of Henry VIII., we are told Pike fetched double the price of a lamb. Fishermen may well sigh, "Oh, for the return of those halcyon days!" The Pike frequents ditches and creeks for the purpose of spawning in the months of March and April. An average sized fish will shed about 200,000 eggs. The fish is supposed to live to a great age, and reference has been made to one that lived 230 years, and attained the length of nineteen feet! The best localities for pike are in the Broads of Norfolk, where plenty have been caught weighing over thirty pounds.

Family CYPRINIDÆ.

THE CARP.

(*Cyprinus carpio.*)



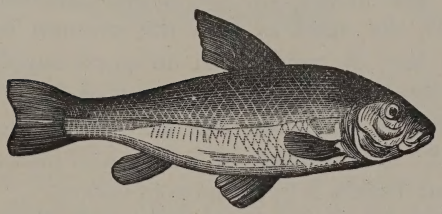
The Carp is distributed over the entire country, and there is hardly a district that has not Carp in the waters in more or less quantities. The Carp is no doubt a fish with much historic interest, and has been held in the greatest amount of estimation as a food-producing fish for several centuries. Remains of Carp stews are to be found in most of the monastic grounds and manor houses of Great Britain. The Carp is said to live to a very great age, considerably over one hundred years; and mention is made of the fish in official records as far back as 1496. This fish is to be found in ponds, lakes, and rivers, and thrives best on rich loamy bottoms. The Carp spawns in the month of June. The ova is adherent, and is shed on weeds, stones, or trunks of trees. The average weight of the Carp is about three

pounds, but many attain to eight or nine pounds, and even twenty pounds. The food of the Carp is a mixture of both vegetable and animal. The Carp hybernates in the winter, and its greatest percentage of growth is in the summer months. The cultivation of the Carp has reached a complete science in Germany, and has become a source of considerable emolument to those who have entered upon "Carp Farming." The species adopted by the German pisciculturists are the Leather Carp, the Mirror Carp, and the Common Carp. The former are much better.

Family CYPRINIDÆ.

THE TENCH.

(*Tinca vulgaris.*)



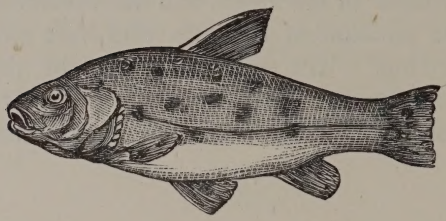
The Tench is a fish principally found in lakes and ornamental waters, and, like the Carp, it will thrive best on loamy bottoms with plenty of weeds, upon which it spawns in the month of June—it is said, when wheat is in the blossom. The food consists of vegetable substances, worms, and larvæ. The Tench hybernates during the winter months in the soft mud at the bottom of the ponds. It is very tenacious of life, and this fact makes it most valuable in transportation from one district to another. The male fish can be easily distinguished from the female on account of its large cup-shaped ventral fins. Isaak Walton refers to the Tench as the Physician of fishes, but the story must be received *cum grano salis.*

Family CYPRINIDÆ.

GOLDEN TENCH.

(*Gola schlei.*)

(*Tinca vulgaris var.*)

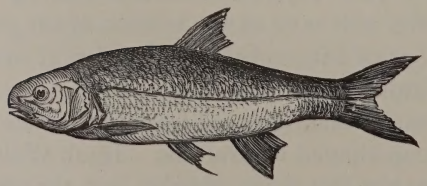


This fish is extremely handsome, and is a variety of the *Tinca vulgaris*. It was first introduced into England in 1867 from Upper Silesia, where it is cultivated in large numbers. The scales are small, and the body supplied with mucus, the same as with the common Tench. The fish thrive best in ponds with an ample supply of weeds. The spawning season is in the month of June. The eggs are adherent in character, and are usually deposited on weeds. The food consists of worms and insects, and, like the common Tench, it hybernates in winter.

Family CYPRINIDÆ.

THE DACE.

(*Leuciscus vulgaris.*)



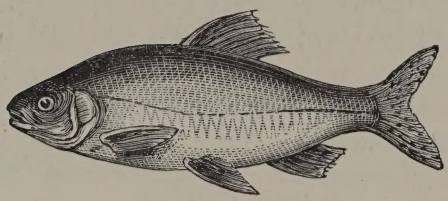
The Dace is a very elegant little fish, and frequents the clear waters of some of the gentle streams of this country.

Its movements are very quick. It is gregarious and feeds on larvæ and worms, while it will rise to a fly like a Trout. The flesh is much superior to that of other members of the Cyprinidæ family. The length of the Dace is about 8 to 9 inches; it spawns in May in the weedy shallows of our rivers.

Family CYPRINIDÆ.

THE ROACH.

(*Leuciscus rutilus.*)



The Roach is generally distributed in all the rivers and waters of Great Britain. It is gregarious and feeds partly on worms and partly on vegetable substances like other members of this family. The Roach swims in shoals, and spawns in May and June upon the weeds that are to be found in the shallows of rivers and lakes. As a food fish it is not held in much estimation. The general length of the Roach is about 8 inches, and a fish attaining the weight of 1 lb is considered a good specimen.

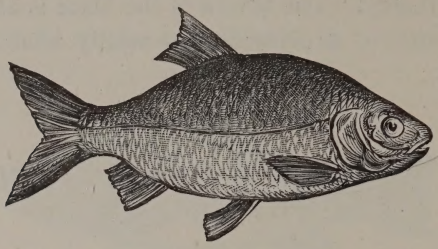
Family CYPRINIDÆ.

THE RUDD.

(*Leuciscus erythrophthalmus.*)

This fish in Norfolk is termed the "Roud," and here it is to be found in large quantities. It also frequents other rivers and ponds of this country. It is very similar to the Roach, but the eye and fins are a brighter red. In some

districts it is known as the "red-eye." The Rudd spawns in May and June among weeds. Its food consists of vegetable matter, worms, and insects. When the Rudd is

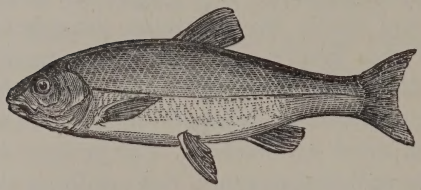


in good condition it presents a very fine coppery tint over its entire surface, and it is from this that its name is derived.

Family CYPRINIDÆ.

THE CHUBB.

(*Cyprinus cephalus.*)

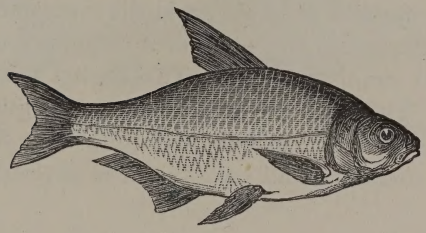


The Chubb is a very common fish, and is to be found in most of the rivers of this country; it is very fond of holes in the neighbourhood of mills, bridges, and weirs. Its food consists of worms, insects and larvæ. As the resorts of the Chubb are chiefly in clear water its eyesight is very quick, and in consequence great caution has to be exercised by the angler in catching it. The Chubb spawns in April and May. As a food fish it is very coarse and not much in favour. Its average weight is from 3 to 4 lbs.

Family CYPRINIDÆ.

THE BREAM.

(*Abramis brama.*)



The Bream is to be found in most of the lakes, broads, canals, and rivers of this country, and prefers deep waters where the large fish are caught. Other varieties of the Bream are known as the White Bream (*A. blicca*), and the Pomeranian Bream. It swims in shoals, and feeds on worms and vegetable matter. The spawning season is in May, during which period the males have white tubercles on the scales, a peculiarity not unknown to the Cyprinidæ family. The flesh of the Bream is coarse, insipid, and bony; its average weight is 2 lbs., but many are caught far exceeding this weight. For instance, one was recently hooked in Norfolk approaching 11 lbs.

Family CYPRINIDÆ.

THE BARBEL.

(*Cyprinus barbus.*)

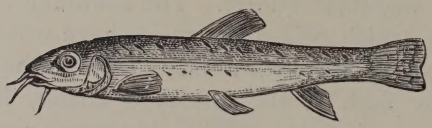
The Barbel is named after the barbs attached to the mouth. The fish abounds in large quantities in the

Thames, and frequents the weedy parts of the river. The Barbel may be called the chairman of the scavengering department of rivers, as it is always rooting up the bottom in search of slugs and other refuse. During the winter it frequents holes and deep places in the river and remains in a torpid state, but in the summer it is to be found in rapid streams and running waters. The Barbel spawns in May and June. The eggs are said to be very injurious to eat. The flesh is poor and insipid, and quite unfit for food, and in order to make it at all palatable it is advised to dry and salt it.

Family CYPRINIDÆ.

THE LOACH.

(*Cobitis barbatula.*)



The Loach and the Spined-Loach are common visitors to our brooks and rivers. It is a very timid ground fish, and hides among the stones and stumps of trees. It is to be found in clear water, and feeds on the bottom, using its six barbules as a means of assistance in selecting its food. The Loach spawns in April. Its food consists of aquatic insects, worms, &c.

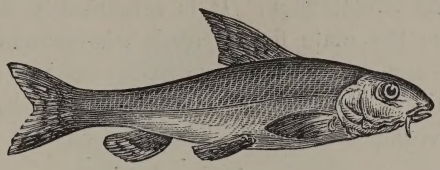
Family CYPRINIDÆ.

THE GUDGEON.

(*Gobio fluviatilis.*)

The Gudgeon is an inhabitant of our rivers and streams. It is a fish of moderate velocity, and it delights in gravelly

bottoms. It swims in shoals, and feeds on worms, insects, and the fry of other fish. The Gudgeon spawns in May,

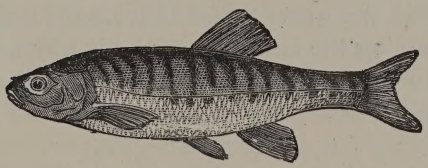


upon gravel or stones, selecting the shallows for this purpose.

Family CYPRINIDÆ.

THE MINNOW.

(*Leuciscus phoxinus.*)



The Minnow is an elegant little fish, and one of the smallest of the Cyprinidæ family. As its name (minimus) implies, it seldom exceeds 3 inches in length. It is to be found in rivers, lakes and canals, and prefers gravelly bottoms, upon which it spawns in the month of June. During this period its colours are most brilliant. Its food consists of vegetable matter and worms. The cultivation of the minnow is of the greatest possible service in breeding Trout or Salmon, and in this respect it should not be neglected.

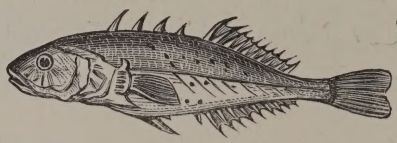
Family SCLEROGENIDÆ.

THE STICKLEBACK.

(*Gasterosteus aculeatus.*)

The Stickleback is a very common fish, and is to be found in abundance in rivers, lakes, and brooks. It will

live in both fresh and salt water. There are four species, namely, the Three-spined, Ten-spined, Four-spined, and Short-spined Stickleback. It is remarkably active in its movements; the male fish is most pugnacious, especially during the spawning season, when his colours are exceedingly beautiful, far more so than his partner. It is also very voracious, and its food consists of worms and



insects. The Stickleback is an exceedingly clever architect, and the skill with which his nest is made has often been a matter of comment. The male fish is a thorough master of his own castle, and guards most bravely the nest containing the eggs, fanning the entrances with his tiny fins in a most determined manner, and is evidently a strong supporter of Home Rule.

Family PETROMYZIDÆ.

THE LAMPREY.

(*Petromyzon fluviatilis.*)

The river Lamprey is a much smaller species than its marine cousin, and frequents most of our rivers. It has no swimming bladder, and is void of pectoral and ventral fins; it has a singular appliance in the mouth, by which it can anchor itself to stones or other substances. The Lamprey is oviparous and spawns late in the spring, and feeds on soft animal matter, larvæ, &c. As an article of food it is considered a very great luxury. It is said that King Henry I. came to an untimely end by eating too freely of Lampreys.

THE OYSTER.

(*Ostrea edulis.*)

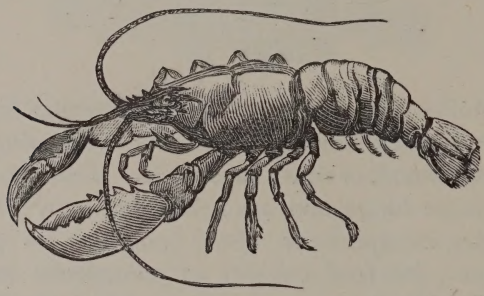
This Mollusc is composed of two irregular lamellated valves, the convex having the faculty of adhering to tiles, stones, slate, wood, or other substances. These shells work upon a single hinge, and are held together by a ligament. The Oyster, except when very young, has no power of locomotion. Its food consists of animalcules and other minute life that float about in the water. The fall of the spat takes place in May and June, but not until the Oyster is from 3 to 4 years old. As many as 2,000,000 eggs are produced by a single oyster. After the eggs are impregnated they gradually develop to a larval condition; these are held in suspension in the water until a further development known as spat is produced, which sinks to the bottom and attaches itself to any favourable substance there. Oysters are taken by dredges, the principal fisheries being at Whitstable and Colchester. As food the Oyster is held in great estimation, and is looked upon as a luxury.

THE LOBSTER.

(*Homarus vulgaris.*)

The Lobster belongs to the "stalk-eyed" variety of crustaceans, the same as the Crab, and is to be found all the year round, but principally in summer. It prefers

rocky coasts, and is captured in pots made of wicker work. The principal seats of industry are at Cromer, on the Norfolk coast, at Land's End, on the Cornish coast, and also to a great extent in Scotland. Like other crustaceans the lobster moults its shell annually even to the thin covering over its eyes. The soft body rapidly attains growth, and soon forms a new shell or armour plating, to be again cast off when the proper period arrives. After the Lobster has acquired its maturity moulting ceases.



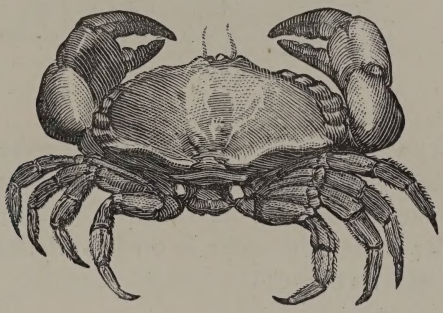
The Lobster carries its eggs or berries under the tail, and will yield as many as 20,000 during the months of April and May. When the eggs are first formed they are extremely small and black, but as they develop a change takes place to a rich brown colour, which will turn to a bright red when boiled. The Lobster has the extraordinary power of shedding its claws and legs at pleasure, and in the ordinary course a new limb will grow, but on a smaller scale, to be covered by shell at the next moulting season.

THE CRAB.

(*Cancer pagurus.*)

The common Crab is caught round our coast in more or less quantities during the entire year, but the principal season is in the warm weather when it frequents shallow waters. The chief fishing stations are off the Cornish and

Norfolk coasts. The Crab belongs to the "stalk-eyed" variety of crustaceans, and has the power of projecting its eyes beyond the socket in order to increase its field of vision. It will be noticed that Crabs and Lobsters have two long claws of different lengths. The smaller claw is for severing the article of food into suitable sizes, while the larger claw is utilised for crushing it up, and to render the food suitable for its digestive organs. The Crab carries its berries or eggs under its tail, the same as the Lobster, and



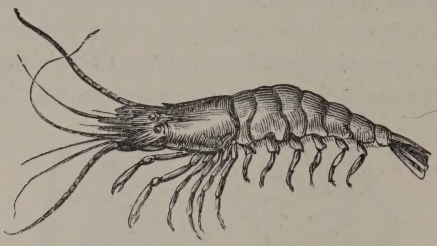
during the months of May and June they are hatched out, in animalcula form, and in great activity. Like the Lobster the same marvellous power is given to the Crab to discard or shoot off from the body a wounded limb at pleasure, and it will reproduce the new claw or leg, but much smaller in size than the old one. The growth of the Crab is obtained by moulting, the same as in other crustacea, and the operation takes place every summer, until it has acquired its full growth. The new shell is rapidly formed.

SHRIMPS.

(*Crangon vulgaris.*)

Shrimps or long-tailed crustaceans are to be found in vast abundance upon any sandy shore along the coast. The Shrimp is caught by a small beam trawl-net, or by a

hand push-net. It has a vast amount of muscular power in its fan-like tail, which consists of several plates so formed as to offer resistance to the water in its movements. During life the shrimp is semi-transparent and closely resembles sea water in colour. The shrimp belongs to the



"stalk-eyed" variety of crustaceans as described in Crabs and Lobsters, and has the power of projecting its eye sufficiently far to see over its back. The Shrimp carries its ova under its tail the same as other varieties of crustaceans, and spawns during the summer months.

LIST OF LOAN EXHIBITORS.

1. MR. W. BARBER, 19, Cincil Street, Lincoln ; One case of stuffed fish, viz. :—four Roach, two Rudd, six Perch, two Tench, and two Pike. One pair of Kingfishers, and one Water-vole.

2. MR. W. H. BUDGE, of 1, Queen's Gate Place Mews ; a Sea-Wolf, and stuffed water birds.

3. MR. G. F. BUTT, 49, Wigmore Street, W. ; two cases of Osprey and Spoonbills.

4. THE CALLENDER BITUMEN TELEGRAPH AND WATERPROOF COMPANY, LIMITED, Erith Marshes, Belvedere ; a Royal Sturgeon, caught in the Thames.

5. Mr. J. W. CLIFFORD, the "Three Colts," Cambridge Road, Bethnal Green ; two cases of Pike ; one case of Bream ; one case of fine Barbel ; and one case of Roach.

6. DR. COBBOLD, 74, Portsdown Road, Maida Hill, W. ; specimen of deformed Trout. This remarkable hump-backed variety of the common trout was taken with the fly in the river Jed, in March, 1854. The shortening of the body is shown by the preparation and drawing to be due to the imperfect development of the bodies of the vertebræ. The form of the fish thus resembles that of a bream. For a full account of this malformation, see *Edinburgh Philosophical Journal*, for 1855.

7. MR. A. C. CRITCHFIELD, 1, Pownall Road, Queen's Road, Dalston ; 16 cases of fish (Tench, Barbel, Rudd, Eel, Pike, Dace, Perch, and Chub).

8. MR. GEORGE CLARK, 48, Warrington Crescent, Maida Vale ; two fine specimens of stuffed Pike.

9. MR. JOHN HUNTER DAVIE, 49, Shaftesbury Road, Hammersmith ; one stuffed Roach in case.

10. MR. E. G. EASTWOOD, Cheshunt, Herts; stuffed Bream, and stuffed Otter.

11. MR. H. EDWARDS, 100, High Street, Kingsland; one case of small Jack.

12. MR. T. EEDLE, 40, Goldsmith's Row, E.; two cases of Tench; one case of Perch; four cases of Kingfishers; one picture.

13. MAJOR PUREFRY FITZGERALD, North Hall, near Basingstoke; one very large specimen of stuffed Pike.

14. THE GRESHAM ANGLING SOCIETY, Mason's Hall Hotel, Basinghall Street, City; one case of Grayling, one case of Perch, one case of Bleak.

15. MR. J. W. GANT, 61, Harcombe Road, Stoke Newington; eight cases of stuffed fish; and one stuffed Heron.

16. MR. J. GARDNER, 149, Oxford Street, W.; three cases of stuffed fish (two of Pike and one of Chub); case of 22 various British Ducks; case of 29 ditto; case of 13 Herons and Bitterns; case of seven Storks, Cranes, &c.; case of 29 specimens of various British ferns; case,—Heron pursued by a Falcon; case,—pair of Canada Geese and three young ones; case of five Gulls and young; case,—Spoonbill; case,—pair of Black-headed Gulls and young; pair of Kingfishers and young; various corals.

17. MR. E. GILBERT, Windsor Castle Hotel, King Street, West Hammersmith; one case of stuffed fish.

18. MRS. ALFRED JARDINE. Cast of six Trout cast on dish; ditto, Perch on dish; painting, "Salmon," by H. L. Rolfe; ditto, "Salmon," by H. L. Rolfe; ditto, "Salmon," by H. L. Rolfe; Portrait of the late H. L. Rolfe.

19. MR. A. G. JARDINE, 38, Old Change, E.C.; case containing two Pike, weight, 73 lbs.; case, one Pike, weight 30½ lbs.; case, two Pike, 41½ lbs.; case, two Pike, 40 lbs.; case, two Pike, 40 lbs.; case, two Pike, 26½ lbs.; case, one Pike, 23½ lbs.; case, one Pike, 23 lbs.; case, one Pike, 21 lbs.; case, one Trout, 26 lbs.; case, one Trout, 19 lbs.; case, one Trout, 12½ lbs.; case, one Trout, 8½ lbs.; case, one Trout, 8 lbs.; case, six Trout, 22½ lbs.; case, two Bream, 14 lbs.; case, seven Perch, 18 lbs.; case, one Bass,

13¼ lbs.; case, two Chub, 11½ lbs.; case, two Chub, 10¾ lbs.; case two Roach, 4 lbs.; basket, containing cast of Pike, 36 lbs.; ditto, 30½ lbs.; ditto, 26 lbs.; cast of Lump-fish, 17½ lbs.; cabinet containing casts of five Perch, weight 12½ lbs.; case, containing Red-throated Divers, winter plumage; case, Great Northern Diver; painting, "Barbel, Chub, &c." by H. L. Rolfe; ditto, "Committee of Taste," by H. L. Rolfe; ditto, "Trout," by T. G. Targett; ditto, "Pike," by T. G. Targett; ditto, "Trout in a Fix," by T. Targett. Large painting. Sea-fish by Isaac Van Duynen, 1653.

20. MR. J. Joel, of 122, Camberwell New Road; stuffed Pike.

20A. MR. G. H. King, "Sea Horse House," 165, Great Portland Street, W.; three cases of stuffed fish:—1. Small Jack swallowing fish nearly double its size. 2. Remarkably fine Gillaroo Trout, 6 lbs. 13 oz. 3. Wandle Trout. 4. One case of Sea-horses.

21. MR. J. G. LAYARD, 40, Millson Road, Kensington; stuffed Thames Trout, the subject of the litigation *Lewis* v. *Layard*, involving the rights of the public to angle in the Thames.

22. Mr. J. A. L. MATTHEWS, 105, Great Russell Street, W.; stuffed Pike, weight 35 lbs.

23. MESSRS. MOORE BROS., Liverpool; Cod fish skull, and skeleton of Penguin.

24. MR. R. B. MARSTON, Editor of the 'Fishing Gazette,' Fetter Lane, Fleet Street; paintings by Rolfe and Targett; diagrams of coarse fish; and farm and hand boxes.

25. REV. J. J. MANLEY, M.A., 39, Upper Kennington Lane; brace of stuffed Trout; photograph of largest Carp ever taken in England; and water-colour drawing.

26. MR. T. R. SACHS, 22, Hyde Park Place; pictures, oil paintings by H. L. Rolfe,—"Committee of Taste," "Feeding Time," "A Catastrophe." Salmon and other fish; Simon Wilder, Fisherman at Maidenhead, painted by Niemann, 1841; stuffed fish; Thames Bream, 5¼ lbs.; ditto, 3½ lbs.; Colne Perch, 3¾ lbs.; Test Grayling, 2 lbs.;

Gillaroo Trout, 2 lbs. ; showing the contents of gizzard and stomach ; Colne Trout, 2 lbs.

27. MISS ALICE SACHS, 22, Hyde Park Place ; oil painting of two Trout ; water-colour painting, two young ladies fishing.

28. MISS FLORENCE SACHS, 22, Hyde Park Place ; stuffed salt-water fish (the originals caught by Miss F. Sachs) ; and cast of three Trout, by the late Mr. Frank Buckland.

29. MR. JAMES STARKEY, 28, Albion Road, Stoke Newington ; fifteen cases of stuffed fish.

30. MR. G. J. TAYLOR, for the "Friendly Citizen" Angling Society, 11, Tranton Street, St. James's Road, Bermondsey ; four Roach in case ; one Roach ; one Tench ; two Tench ; one Chub.

31. MR. G. VALE, 27, Hammersmith Road ; one large Pike ; one Thames Trout ; Shark's head.

32. MR. J. WHALE, 74, Leadenhall Street, E.C. ; four pairs of Clamshells ; four Narwhal horns ; four Tortoise shells ; four Rhinoceros horns ; two pairs of split horns, and four mammoth tusks.

33. MR. G. WOODMAN, 60, Camberwell New Road ; ten cases of stuffed fish.

34. MR. J. WEBB, King's House, Hythe ; snout of Swordfish.

35. MR. W. S. WEBSTER, 1, Bedford Court, Old North Street, Red Lion Square ; five cases of stuffed Roach, one case of Trout ; and pictures.

36. MR. E. SACHS, 22, Camden Street, N.W. ; casting net ; 1 bamboo rod ; 3 fish creels ; 1 reel and line ; 1 fish trap ; 1 stuffed Parrot Fish ; 2 fishermen's hats.

37. MR. and MRS. CARR, Berwick-on-Tweed ; stuffed fish ; paintings ; fish-eating birds ; anchor brought up by a sea trawler ; Sea Leech in spirits.

38. MARQUIS OF EXETER, Burghley House, Stamford ; four pictures of fish ; one stuffed Sea Angler ; one case of sea birds.

39. MR. R. L. PUGH, 16, Comeragh Road, West

Kensington. 1. Case of Perch, 12 fish weighing 32 lbs. 3½ oz. 2. Trout from Thames, 9 lbs. 8 oz. 3. Trout from Thames, 6 lbs. 4 oz. 4. Trout from Thames, 5 lbs. 5. Perch from Kennett, 5 fish, 12 lbs. 7 oz. 6. Perch from Kennett, 5 fish, 12 lbs. 10 oz. 7. Perch from Thames, 2 fish, 3 lbs. 14 oz. 8. Four cases of Barbel, one fish in each, total weight 44 lbs. 5 oz. 9. Jack from Thames, taken with worm, 10 lbs. 8 oz. 10. Jack taken from Thames with worm, 12 lbs. 8 oz. 11. Chub, taken from Thames with a single hair line at Henley, 4 lbs. 10 oz. 12. Chub from Thames, 4 lb. 11 oz. 13. Chub from Thames, 5 lbs. 4 oz. 14. Tench from Thames, 6 lbs. 3 oz. 15. Dace from Thames, one fish, 11½ oz. 16. Dace from Kennett, 6 fish, 4 lbs. 10 oz. 17. Dace from Kennett, 2 fish, 1 lb. 8 oz. 18. Dace from Kennett, one fish, 14½ oz. 19. Pope from Thames, 3½ oz. 20. Heron. (All taken in three years by exhibitor.)

39A. MRS. R. L. PUGH ; Otter from Thames.

40. MR. S. J. SHEEN, 105, Camberwell New Road ; two cases of stuffed fish.

41. DR. J. BRUNTON, 21, Euston Road, N.W. ; one case of Grayling ; one case of Lea Trout.

42. THE WEST LONDON ANGLING SOCIETY, per Mr. E. D. Mathews, the Windsor Castle Hotel, Hammersmith ; cases of stuffed fish.

43. CAXTONIAN ANGLERS, Falcon Hotel, Gough Square ; several cases of stuffed fish.

44. MR. J. BROWN, Haddington ; combined aquarium and fernery.

45. MR. J. PAUL TAYLOR, Bromley, Kent ; case of one stuffed Perch, 3¾ lbs. weight ; also case of one Roach, 7 lb. 13 oz.

46. MR. CLAUDE SACHS, 22, Hyde Park Gardens ; Japanese tapestry ; two China plates ; one China sauce-boat ; two Japanese fans ; carved wood Haddock ; Japanese handkerchief ; fishes in colours ; Japanese plaque.

47. MR. A. W. BEASLEY, 14, Greville Place, Maida Vale ; a Pike Perch, weight 14 lbs.

48. MR. H. B. EYRE, Elgin Lodge, Weybridge; three cases of Otters.

49. THE RICHMOND PISCATORIAL SOCIETY, Richmond; 13 cases of specimen stuffed fish.

50. MR. HORSEY; series of photographs (taken by himself) of the interior of the National Fisheries Exhibition, Norwich.

51. LORD GEORGE GORDON; casts of two Salmon caught by his Lordship.

52. MR. T. G. TARGETT; eleven paintings.

53. MR. HERBERT CHAMBERS, M.R.C.S.; case of Spider Crabs.

54. MESSRS. EATON & DELLER, Crooked Lane, London Bridge; seven cases of stuffed fish.

55. MR. J. R. FAULKNER; four cases of fish.

56. MR. C. A. WATTS, 8, Brunswick Square, Camberwell; Cat's-head.

ANTHROPOMETRIC LABORATORY;

ARRANGED BY

FRANCIS GALTON, F.R.S.,

FOR

THE DETERMINATION OF HEIGHT, WEIGHT, SPAN, BREATHING POWER, STRENGTH OF PULL AND SQUEEZE, QUICKNESS OF BLOW, HEARING, SEEING, COLOUR-SENSE, AND OTHER PERSONAL DATA.

VOL. XIX.

THE

ANTHROPOMETRIC LABORATORY

ARRANGED BY

FRANCIS GALTON, F.R.S.

THE object of the Anthropometric Laboratory is to show to the public the great simplicity of the instruments and methods by which the chief physical characteristics may be measured and recorded. The instruments at present in action deal with Keenness of Sight; Colour-Sense; Judgment of Eye; Hearing; Highest Audible Note; Breathing Power; Strength of Pull and Squeeze; Swiftness of Blow; Span of Arms; Height, standing and sitting; and Weight.

Such is the ease of working the instruments that a person can be measured in these respects, and a card containing the results furnished to him, and a duplicate made and preserved for statistical purposes, at a total cost of 3*d.*

The use of periodical measurements is two-fold, personal and statistical. The one shews the progress of the individual; the other, that of portions of the nation, or of the nation as a whole. We will consider these two uses separately.

Personal use.—Periodical measurements afford a sure test whether the physical development of the child or youth is proceeding normally. They draw attention to faults in rearing to be diligently sought for and remedied,

lest the future efficiency of the child, when it grows to manhood or womanhood, be compromised. There are hundreds of thousands of cases in which eye-sight has been heedlessly injured beyond repair by pure neglect; of lop-sided growth, and of stunted chest capacity, which measurement would have manifested in their earlier stages, and which could have been checked if attended to in time. The necessity of periodical measurement is thoroughly recognised by those who have studied the subject of health, but it has not yet obtained that hold on popular opinion which it deserves, and which it will hereafter undoubtedly exercise.

Statistical use. — Anthropometric records are treated statistically to discover the efficiency of the nation as a whole and in its several parts, and the direction in which it is changing, whether for better or worse. They enable us to compare schools, occupations, residences, races, &c. The Anthropometric Committee of the British Association took great pains to collect available data for inquiries of this kind, but their returns were by no means adequate to solve even the more important national questions, although many interesting facts were derived from them. There is great need for a more systematic registration of physical measurements. Their value is indisputable, the cost of making them is trifling, and the facility of registration in any permanent institution is obvious. It seems strange that they should be neglected at any school or university.

To show the use of preserving even the minor personal data, it will be well to dwell for a moment on the colour of the Eyes and Hair, which might be thought at first sight to have no obvious bearing on the general efficiency of the nation. This is far from being the case. The British nation is partly a blend and partly a mosaic of very distinct types. The short black-haired ancient British race unites imperfectly with the tall fair-haired Danish or Scandinavian. Their union resembles what druggists call an emulsion, that is, a mixture of oil and water, so well shaken together that they form an apparently homogeneous substance; but the com-

bination is not durable. Leave the emulsion alone, and after a longer or shorter time it will separate into its component elements. Types are stable, but the forms of their mongrel offspring are not; and whenever the external features of the old types are found in something of their original purity, it is reasonable to suppose that their inward characteristics are present also.

Whether it be as a race peculiarity or not, the colour of the hair is related, at least in America, to certain forms of immunity from disease or susceptibility to it. This is shown by the statistics published by the American War Office in 1875, under the direction of Dr. Baxter. At the time of the war of their rebellion all male citizens of the United States between the ages of 20 and 45 years were medically inspected with great minuteness, to learn how many were fit for service. About one quarter of those examined were rejected, and the diseases that incapacitated them are specified in Dr. Baxter's book, together with various particulars, including the colour of the hair and eyes. It appears from an analysis of between 330,000 and 340,000 of the best reported cases of invalidism, that the proportion of the light complexioned men who were unfit for service was larger than that of the dark. The light haired men in America were more affected than the dark haired by every form of disease except chronic rheumatism. A diagram in which these proportions are shown is hung up in the laboratory.

It follows that even the colour of the hair is a proper subject for anthropometric record; much more may we feel assured that obviously important personal data deserve measurement and registration.

DESCRIPTION OF THE LABORATORY.

A space 36 feet long by 6 feet wide is fenced off from the side of a gallery by open lattice-work. It is entered by a door at one end, and is quitted by a second door at the other. The public can easily see through the lattice work, while they are prevented from crowding too close. A narrow table runs half-way down the side of the laboratory, on which the smaller instruments are placed. The measurements with the larger ones take place beyond the table.

The successive stations for the various operations lie in the following order :—

1. Desk at which the newly-entered person writes down certain data concerning himself.

2. Standard colour for eyes and hair.

3. Sight : (*a*) its keenness ; (*b*) the colour-sense ; (*c*) judgment of the eye in estimating length and squareness.

4. Hearing : (*a*) its keenness (scarcely practicable on account of the noise and echoes) ; (*b*) highest audible note.

5. Touch (exhibition of various apparatus).

6. Breathing capacity.

7. Swiftness of blow with fist.

8. Strength : (*a*) of pull ; (*b*) of squeeze with right and with left hands.

9. Height : (*a*) when sitting, measured from the seat of the chair ; (*b*) standing in shoes ; (*c*) the thickness of the heel of the shoe.

10. Span of the arms.

11. Weight.

PROCESS GONE THROUGH.

1. THE DESK.—On payment of 3*d.* at the door, the applicant is admitted to the desk, and given a frame which contains a card, over which thin transfer paper is stretched. Carbonised paper is placed between them. Thus a duplicate copy of the entries is obtained, to be kept for statistical purposes. The card with the entries upon it is given to the person measured.

No *names* are asked for. The following plan is adopted to secure such data for the duplicate copy as are needful for its use as a statistical document, without annoying the applicant, who may be disinclined to parade his or her age, &c., on the card. The transfer paper is doubled over the back of the card, and no carbonized paper is put behind the flap; consequently what may be written upon it will not appear on the card. The particulars required on the flap, are: Age last birthday; birthplace; state (married, unmarried, or widowed); residence, whether urban, suburban or country; occupation. All this takes place at the first station, which is partially curtained for the sake of privacy.

When these data have been written, the frame is turned over, and the other side is henceforth uppermost. On this the attendant marks the sex, and the applicant writes his initials or other distinguishing mark, to guard against any accidental interchange of the frames belonging to different persons who are simultaneously undergoing measurement.

At this same station is suspended a card with specimens of wool of various shades of green worked upon it. Attention is directed to these specimens, that the applicant may clearly understand what will be required of him a few stations on, when his colour-sense is tested by his being asked to pick out all the green shades from among many wools of different colour. It is important that he should appreciate the wide variety of shades that are used,

otherwise, he may fail in the test, owing to a misunderstanding of what he is wanted to do.

2. Colour of Eyes and Hair.—Artificial eyes of standard colours are exhibited, together with the following list of descriptive names—dark-blue, blue, grey, dark-grey, brown-grey (green, light hazel), brown, dark-brown, black. The attendant will note the colour of the eyes, but no entry is made regarding the colour of the hair, for the reason that what with the darkening effect of pomades, and of dyes, and the misleading appearances of false hair, no useful results could be arrived at. However, for the convenience of the visitor, samples of standard colour of hair are exhibited, and the names are attached by which the chief varieties of colour are usually described. They are flaxen, light-brown, brown, dark-brown, fair red (golden), red, dark red (chestnut auburn), black.

3. Sight.—(*a*) *Keenness of eye-sight* is measured by the greatest distance at which the small print known as "diamond" type can be read.

The eyes are tested separately, as it often occurs that they differ considerably in efficiency without the person being aware of the fact, who ought in that case to use appropriate glasses.

The apparatus is a long and light frame with a single eye hole. Blocks of wood, each with a sentence in diamond print pasted upon its end, are fastened square to the line of sight at measured distances along the frame. First the right eye is tested, and then the left eye, and the greatest distance at which the type can be read by each of them is recorded. If the print cannot be read at all by the unaided eye, a note is made to that effect.

b. Colour-sense.—A series of bars are packed closely side by side in a frame, looking something like the keys of a pianoforte. Along the middle part of each of these bars a differently coloured wool is wound lengthways, and

the foot of each bar is stamped with a separate number. In the frame there are as many peg-holes as there are bars, one hole to each bar. The order of the bars can be changed when the instrument is unlocked. The frame is placed before the person to be tested, the numbers are hidden by a flap, and he is required to insert a peg opposite each of the bars that has any shade of green wool wound upon it. After he has leisurely done this to his satisfaction, the attendant lifts up the flap and displays the numbers of the chosen colours, and records the fact of his having judged rightly or wrongly as the case may be.

c. Judgment of Eye as regards length.—A board has two pairs of parallel strips of wood fastened across it, between each of which a bar slides freely. In each case a square rod, 15 inches long and somewhat longer than the bar, is hinged to it along its edges, and, when closed down upon it, hides it altogether. There are moveable pointers attached to the lower of each pair of strips. In the one pair, it is set somewhere about midway, and the person to be tested is desired to slide the rod until its middle is brought as nearly as he can judge opposite the pointer. When he has done this, the hinged rod is lifted and the face of the bar is exposed. This has a central fiducial mark, and bears graduations on either side of it, each equal to $\frac{1}{100}$ of the total length of the rod. The error of adjustment is thus determined in percentage.

The second rod has to be set so that the pointer shall correspond to one-third of its length, and the error of adjustment is similarly read off in units, each equal to a hundredth part of the total length of the rod.

As regards Squareness.—A board including a sector of a circle, has an arm movable about the centre of the circle, while a broad flap hides its free end. A black line is drawn across the board. The person tested is desired to set the arm as squarely as he can to the black line. When he has done this, the attendant lifts the flap and exposes a scale of degrees graduated on the foot of the

board, and reads off the error of the setting of the arm in degrees.

HEARING.—(*a*) *Its keenness.*—Some apparatus is exhibited by which at least the relative acuteness of hearing can be tested ; but it will not be used, as the noises and echoes of the building render such determinations untrustworthy.

(*b*) *Highest audible note.* — An indiarubber tube communicates through 5 others with 5 fixed whistles of small bore, and of depths that will give 50, 40, 30, 20, and 10 thousand air vibrations in a second respectively—that is, of the several depths of 0·067, 0·084, 0·113, 0·169, and 0·380 inch. Each tube is nipped by a separate clamp. These are numbered in order, 5, 4, 3, 2, 1, and serve as keys. When any one of them is depressed, air is blown through the corresponding whistle, and is thrown into vibrations that can be heard by some as a shrill and pure note, while others hear merely a puff or nothing at all. Every person has his limits of power of hearing high notes, quite independently of the general acuteness of his hearing. The test lies in ascertaining which is the shrillest of the five notes that is audible. The precise limit of audible sound may be found by using a whistle that has a movable plug for its base.

TOUCH, &C.—Several instruments are exhibited, but it is not proposed to test with them, as the requisite time cannot be spared.

BREATHING CAPACITY.—A spirometer is used, made by a counterpoised vessel suspended in water. When the air is breathed through a tube the vessel rises, and the scale at its side shews the number of cubic inches of displacement. The person to be tested fills his chest and expires deeply three or four times for practice, then, after a few seconds rest, he tries the spirometer.

SWIFTNESS OF BLOW.—A flat bar with a pad at one end

runs freely between guides. The blow is delivered with the fist straight at the pad, driving the rod nearly or quite home, and its swiftness of motion is measured as follows :— Across its path a bridge is fixed and a flat steel rod projects from the bridge, lying above the bar and parallel to it. Its free end points in the same direction as that towards which the bar is driven by the fist. When the bar is set back ready for use, a stud upon its face holds the spring forcibly to one side, but as soon as the bar begins to move, the stud leaves the spring, which thereupon vibrates transversely to the moving bar. A pencil is attached to the spring, and the upper face of the bar carries a strip of the cardboard used for white flexible slates. The pencil leaves a sinuous trace on the strip, and the points where the trace crosses its own median line can be measured with precision. The spring that is used, makes twenty-five complete vibrations in a second. Hence, if the interval between any two alternate crossing points is 0·48 inch in length, the bar is travelling 1 foot per second. A scale is constructed of which the unit is 0·48 of an inch, and the graduations upon it are in feet per second. By applying this scale to the curve, the swiftness of the corresponding blow is immediately read off.

STRENGTH (*a*) *of pull.*—The instrument is held as an archer holds his bow when in the act of drawing it, and the strength of the pull is given by the index.

(*b*) *of squeeze.*—The instrument is tried first in the right hand, secondly, in the left hand.

SPAN OF ARMS.—A pair of rods, sliding over each other and with projections at either end, is held so that the tips of the fingers press against those projections; then the arms are extended to their full stretch. The graduations show the span.

HEIGHT (*a*) *above seat of chair.*—A quickly acting measuring-rod is fastened upright to the back of a solid and narrow chair.

(*b*) *Standing in shoes.*—This is taken by a measuring-rod fixed against the wall.

(*c*) The thickness of the heel of the shoe is measured.

Lastly, *c* is subtracted from *b*, which gives—

(*d*) The Height without Shoes.

WEIGHT.—A simple commercial balance is used, as cheaper, more accurate, and much more capable of bearing hard usage than the lever balances. Its sole disadvantage lies in the necessity of handling heavy weights during its use. Overcoats should be taken off, the weight required being that of ordinary indoor clothing.

Most of the instruments in use at the Laboratory are wholly or in large part of my own designing. Those that are not, are the spirometer, the instruments for testing strength of pull and of squeeze, and the weighing machine. Mr. Gammage, of Messrs. Tisley & Co., 172, Brompton Road, assisted me in putting the instruments in working order. The larger of the small whistles are made by them; the smaller and more delicate ones are made by Mr. Hawkesley, 357, Oxford Street.

FRANCIS GALTON.

INTERNATIONAL HEALTH EXHIBITION, 1884.

ANTHROPOMETRIC LABORATORY,

Arranged by FRANCIS GALTON, F.R.S.

Sex Colour of eyes

Date Initials

EYESIGHT.

	right eye	left eye
Greatest distance in inches, of reading "Diamond" type		
Colour sense, goodness of		

JUDGMENT OF EYE.

	in three parts	in two parts
Error per cent. in dividing a line of 15 inches		
Error in degrees of estimating squareness		

HEARING.

Keenness can hardly be tested here owing to the noises and echoes.

Highest audible note ... between 0.000 and 0.000 vibrations per second.

BREATHING POWER.

Greatest expiration in cubic inches

SWIFTNESS

of blow of hand in feet per second

STRENGTH

of squeeze in lbs. of right hand ... of pull in lbs.

left ,, ... of pull in lbs.

SPAN OF ARMS

From finger tips of opposite hands ... feet, ... inches.

HEIGHT

Sitting, measured from seat of chair ... feet, ... inches.

Standing in shoes ... feet, ... inches.

less height of heel..... ... inches.

Height without shoes ... feet, ... inches.

WEIGHT

in ordinary in-door clothing in lbs.

Age last birthday? _____

Married or unmarried? _____

Birthplace? _____

Occupation? _____

Residence in town, suburb or country? _____

CHINA.

REMARKS ON CERTAIN POINTS

RELATING TO

PUBLIC HEALTH IN CHINA.

BY

SURGEON-GENERAL C. A. GORDON, M.D., C.B.,
HONORARY PHYSICIAN TO HER MAJESTY THE QUEEN.
IN FRANCE: OFFICIER DE LA LÉGION D'HONNEUR, ETC., ETC.

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PUBLIC HEALTH IN CHINA.

Introduction.

Fourteen years ago, acting on the suggestion of Dr. Jamieson of Shanghai, Sir Robert Hart, K.C.M.G., took steps to obtain from medical practitioners connected with the Chinese Imperial Maritime Customs at Treaty Ports, what has proved to be a most valuable series of Reports on various subjects connected with public health. To instructions in regard to the preparation of these Reports a ready and full compliance was accorded by the gentlemen concerned, and at the present time, by means of their co-operation, much information that otherwise would not have been obtainable without considerable difficulty, is ready at our hand, and arranged so as to admit of easy reference. The chief items out of the many discussed in the documents with which we have now to do are such as bear more directly upon the hygienic conditions of residents, native as well as foreign, of those portions of China with which as a nation we have the most direct intercourse.

Concessions and Ports.

The great northern capital of that empire demands attention for the reason that in it are located the several foreign embassies, the headquarters of the service just mentioned,

Note.—The numbers in the margin refer to the pages of the Epitome of Reports in which the several points herein alluded to are more fully discussed.

and also a very considerable foreign population, including European and American official and non-official classes.

The ports to be more particularly alluded to as we proceed are nineteen in number. Of these, nine occur along the coast line of China proper; two on that of the island of Formosa; one on the island of Hainan, and seven on the banks of rivers at various distances from the sea from a few miles to one thousand and upwards.

The whole number thus enumerated are distributed over a geographical area which extends from Peking in Lat. 39° 52′ N. Long., 116° 28′ E., and Newchwang in Lat. 40° 35′ N. Long., 122° E. southward to Kiung-chang, otherwise Hoihow on the island of Hainan in Lat. 20° 3′ N. Long., 110° 19′ E. Conditions, geological, meteorological and others, differing from each other in degree and character prevail throughout the area thus comprised—those conditions exerting their influence upon organic nature in general, indigenous races of man more especially, and residents who are foreign to the soil most of all.

CLIMATE.

The term *climate* is expressed in Chinese by *Feng-shui*, that is, air and water; the expression thus bearing testimony of the relation assigned to these two elements in regard to public health. Among the native inhabitants of India the equivalent of the above Chinese expression is *Hawa-pawnee*, that is, wind and water; thereby indicating that a similar belief also pervaded the great western division as well as the far east of Asia.

Of China generally the average temperature is described as being lower than that of any other country in the same latitude, and the coast as being subject to the same extremes as that of the Atlantic States in America. The isothermal line of 70° F., as the average for the year, which passes south of Canton, runs by Cairo and New Orleans, eight degrees north of it; the line of 60° F. average passes from Shanghai to Marseilles, Raleigh, St. Louis, and north of San Francisco; and the line of 50° F. average goes near

MAP TO ACCOMPANY EPITOME OF MEDICAL REPORTS &c.

James Wyld, 11 & 12 Charing Cross, London.

Peking, thence on to Vienna, Dublin, Philadelphia, and Puget's Sound in Lat. 52° N. Canton is the coldest place on the globe in its latitude, and the only place within the tropics where snow falls near the sea-shore. At Peking, the extreme range of temperature is from 104° F. to considerably below Zero (Williams, i., 51).

Here is the description given of the climate in Lat. 25° 45
58′ N., and the conditions recorded vary to a greater or less extreme extent as we advance to the north, or return southward. With regard to the climate in the locality indicated : From April till September, though the sensation of heat during the day was excessive, the nights were usually tolerably cool. Although slight rain occurs in February, as a rule the great rainy season begins about the end of April and lasts till the first week of June. From the latter date till the middle of October, the atmosphere has all the properties of a vapour bath, producing on the human frame a feeling of indescribable languor and oppression, with an exhausting perspiration. For the entire year rain fell in 1874 on 115 days; the total rainfall 37·5 inches.

Floods, Famines, &c.

From ancient times down to the present, China has been subject at intervals more or less defined to earthquakes, inundations, hurricanes, murrains in cattle and other animals, visitations by locusts, blights, and famines. A reference to the chronological record given in my published epitome will indicate the frequency with which these phenomena have corresponded in date of occurrence with 39
the outbreak or prevalence of epidemic disease in man. The record of epidemics preserved by Chinese historians is remarkable for accuracy and completeness, no less than for the great length of time during which it has been maintained. For example, two thousand years B.C., cholera was not only described in China, but it was so under the precise name (*hwo-luan*) the disease bears in that country at the present time. The terrible famine by which, in

1877–8, the northern provinces of the empire were visited,
384 coincided in origin with that in the Madras Presidency. The horrors inseparable from the former of these calamities were to some degree met by the exertions of native Chinese, official and otherwise, aided by foreign contributions, including £31,100 from the United Kingdom ; those of the latter, through the application by zealous and efficient officers of measures inaugurated and watched over by His Grace the Duke of Buckingham and Chandos.

Rebellion.

In certain parts of China the depredations committed by the Taiping rebels are not yet effaced, although twenty years have elapsed since that frightful scourge was suppressed through the energy and talent of the gallant commander of the "Ever Victorious Army." Here is a good picture of the condition of one such region :—One enters a city, and the eye wanders over a huge waste of weeds and thistles. Perhaps not more than a tenth, or a twentieth of the space inside the wall is built over, and even that, by houses of the poorest description ; a few are of brick, but the greater part are of wood, or mere reeds and plaster. They are huddled together close by the principal gate, and round them hangs a fringe of the most wretched huts occupied by squatters and beggars. Instead of the busy bustling crowd, commonly to be met with in well-to-do Chinese towns, the traveller sees only a few listless straggling individuals, dirty, ragged, and idle. Following the line of the street, the shops contain only the commonest necessities of life. For a few tens of dollars the most of them could be emptied of their whole contents. Even through the houses the visitor wanders over acres and acres of broken bricks and stones, and here and there are pillars of an ornamental gateway still standing, to mark where a temple or other public building has been ; or he stumbles over carved stone work, now grass-grown, and half buried, to tell of the wealth of former rich inhabitants. (Chinese Consular Reports, 1881, Kiukiang, p. 52.)

Dwelling Houses.

In the more northern cities, the general construction of 1
the dwelling house is such that in summer it admits of being well ventilated, but in winter not so. Whenever practicable the house is so planned as to face southwards. As a very general rule a Chinaman's house consists only of one story in height ; his philosophy teaching him that it is unseemly for one person to raise himself above his fellows. It is well lighted, two sides being almost quite composed of doors and windows, the latter consisting of Corean paper—more recently of glass. The usual fuel is anthracite coal ; fireplaces are outside the apartments to be heated, but certain portable stoves, similar in some respects to those used in certain continental countries, are carried by individuals in winter, the better to keep themselves warm.* Firewood is scarce, the coal of inferior quality, and dear ; hence the necessity of using both kinds of fuel sparingly. Coal-dust mixed with clay, and then made into balls, is ordinarily made use of in open stoves.

The houses of the poor are dark, dirty, low, and narrow tenements ; the floor is of earth, covered with mats or tiled ; the doorway the only opening, on which a swinging mat conceals the interior. The whole family often sleep, eat, and live in a single room. Pigs, dogs, and poultry, dispute with children and furniture—if a table and a few tressles and stools, pots and plates, deserve that name (Williams, i., 734). On the outskirts of the town a still poorer class take up with huts made of mats and thatch upon the ground, through which the rain and wind find their course. And yet, as we learn, the residents in such places live, enjoy good health, are cheerful, and remarkably exempt from epidemic outbreaks of disease (Williams, i., 734 ; also p. 50.)

In the more southern parts of the empire, the ordinary

* Some portable stoves of the kind here alluded to, may be seen in the Chinese Department of the Exhibition.

houses to be met with are mean structures, built without any domestic convenience, having only one room wherein the different members of the family sleep and eat. These houses consist generally of unburnt brick-tiles; they are covered with similar material. The single window by which light is admitted is provided with panes of paper,
41 shell, or glass, according to circumstances; in others, a "blind" made of reeds prevents the inquisitive passer-by from prying into the secrets of domestic life within. The floor, for the most part unraised, like walls and roof consists of bricks; there is no basement drainage, and hence the rooms are usually damp. In some places, however, notably Wenchow, the floors are not only well raised, but are also in a measure drained. Arrangements for domestic conservancy are in a deplorable condition, according to our Western ideas of what they should be.

The common classes sleep upon a boarded bedstead, whereon they place a kind of rug or mat. Their covering at night consists of part of the dress they wear by day; this they throw aside or retain according to the temperature of the atmosphere, which frequently varies during the twenty-four hours as much as 45° F. They use pillows made of cane, especially in summer or when travelling; these they sometimes cover with skin or leather. The pillows of this kind are very light and elastic; being hollow, they are sometimes converted into a kind of trunk or portmanteau, and even as a receptacle for writing materials &c. In the northern provinces of the empire the Chinaman sleeps and passes much of his unoccupied time on a raised platform situated in an inner room. The k'ang* —so this construction is named—is ordinarily formed of woodwork, and is heated from without. Some examples of the Chinese sleeping place are to be seen in that court,

* It would be interesting to enquire as to whether or not any connection other than mere coincidence exists between the K'ang of Northern China, and the Ka'ah of upper, or "Furn" of Lower Egypt, on which the natives are said to sleep without any covering over them (Lane's 'Modern Egypt,' vol. i., pp. 22–28).

and of them it may with truth be said, that they are in plan and arrangement very elaborate, and, moreover, richly ornamented.

Foreigners' Houses.

As a general rule, foreigners, official and non-official, reside in well-raised, airy and commodious houses; these houses occupy sites on Concessions made by the Imperial Government, and are generally separated more or less completely from the portions of cities in which the Chinese inhabitants live and pursue their several modes of life. For the most part, such houses are constructed according to approved principles of sanitation; their system of conservancy being, according to the "dry" method generally adopted in the East. But there are exceptions to this rule. In an official report for the year 1881, the writer describes his position after this manner: "The lonely life of a consular officer at such a port as"—the one where he resides —"where, instead of occupying a foreign built house raised a few feet from the level of the ground. . . . We are miserably lodged in Chinese houses. We are constantly ill. We can keep water out of our houses, but not dysentery and fever." (Consular Reports, China, 1881, Ichang, p. 42.)

Cities.

The cities occupy positions for the most part upon the bank or banks of navigable rivers; in some few instances on the shores of sheltered bays or roadsteads. Inland, almost from their very confines, every available piece of land is carefully and profitably cultivated; extensive irrigation is practised, and fields fertilised by means of human excreta in a particular stage of decomposition. This rule is varied 15
in the case of Chefoo. Behind that settlement a richly cultivated and extensive plain extends to the base of the adjoining hills, forming a vista at once pleasing to the eye and suggestive of health. To the south and east of Chin- 19
kiang, a succession of hills rise to a height varying from

200 to 1000 feet. In these hills, foreign residents have caused paths to be cut, and one may wander along them for miles among striking and beautiful scenery.

The plan and general arrangement of cities in China present important varieties. The northern capital is well laid-out; the great thoroughfares, 120 to 200 feet wide, the lanes broad enough to allow three carts to pass abreast; the centre of the roads raised, materials being obtained from pits made for the purpose at the sides, which pits serve as substitutes for drains in the rainy season. In the more southern parts of the empire the streets are extremely narrow, that is, their breadth varies from eight to twelve feet. Ventilation is consequently imperfect. As in other parts of the Oriental world, they are covered by matting stretched across them from house to house. As a result of this practice, the sensation of heat is more severely felt in cities than in the country, but this inconvenience is counterbalanced by the protection thus afforded against evils due to the direct exposure to the sun. There is every reason to believe that, as in India, so in China, the experience of ages led to this arrangement of their cities, notwithstanding that, according to the custom of the period, it is now declared by some of us Westerns to be opposed to principles of hygiene.

But in the original plans of some among those cities is to be found evidence that considerations of a nature, now included in the general term "sanitation," were carefully taken into account by their designers. In nearly every instance constructions originally contrived with this object have fallen into a state of decay more or less complete; and in general, sanitation, as understood in the West, is unknown or ignored in China. Definite instances in illustration may be quoted. In Peking the streets serve the
1 purpose of public latrines; urinals do not exist; filth and refuse of all kinds are thrown into the thoroughfares; human manure is collected in vessels or in heaps at the doors of houses and immediately outside the city, to be used, as occasion requires, to fertilise the neighbouring fields. In

1871, that capital "in regard to drains stood unrivalled among the cities of the world. Their age, extent, former admirable adaptation, and their ruinous condition were alike striking." At Hankow, "between the latrines of private houses and the main drains there are usually small closed channels, so that regurgitation both ways must necessarily take place. Latrines are constructed without regard to cleanliness; their neighbourhood saturated with odours of the most intense description. In some instances private dwellings, and even restaurants doing a thriving business, may be seen attached to these latrines, and only separated from them by a thin partition insufficient to oppose the passage of polluted air. At Shanghai, of late years, an immense deal has been effected in the way of sanitary improvements in connection with the foreign settlement there. Thus, roads have been widened and kept in good order, drainage extended, streets and alleys cleansed, creeks as far as possible kept clean, public gardens improved, trees planted, hospitals subsidised, &c. But the following description still applies to a greater or less degree, as it did to full extent a few years ago:—During the spring, summer and autumn months, the fields are plentifully manured with night soil, more or less diluted, which has been preserved in vats until it has attained a degree of maturation judged of by some standard known to the Chinese themselves. The atmosphere is described as being "filled with pungent particles from the ground so treated;" but yet, "it is well to add," so says the reporter from whom the quotation is made, that "no authentic case of disease arising from the adoption of sewage irrigation has been observed in the neighbourhood of the farms so treated." At Ningpo, improvements of the same kind were being enthusiastically pressed forward. The city of Wenchow appears to have been planned with due regard to sanitary laws. How it came to be so does not appear, unless on the assumption that such laws were recognised in China before they were so in the Western world. Its streets are regularly laid out and paved; their roadways slope on either side

towards gutters, and these in turn communicate with canals which run through the city. At intervals in the streets are latrines and urinals, their contents emptied in the early morning, and either destroyed by fire or utilised as manure to the fields. Decomposing matters were not to be met with in the streets, and the perfect system of drainage obviated many of the disadvantages of the rainy season.

44 Of Foochow, on the other hand, it is recorded that there is nothing like drainage; the creeks differ little, if they differ at all, from the conditions to be presently stated in regard to Canton; the traffic in night-soil, watering the fields with liquid manure, obtain here as elsewhere; in short, we have all the recognised factors of zymotic disease, with a high temperature to favour the fermentation and putrefactive processes. And yet, to quote from the report on Foochow: "There is a remarkable freedom from zymotic diseases," at this port.

49 The streets of Amoy are dirty in the extreme. Pigs and dogs there represent the elaborate machinery of sanitation in English cities. A "scientific" sanitarian, with only home experience to guide him, would confidently predict the reign of epidemics and death. Yet the Chinese manage to live and thrive where he would hardly dare to lodge his pigs. There is no typhus, no typhoid, or other disease considered the inevitable consequence of defective sanitation, though Amoy is full of typical fever dens.

62 The remarkable feature of Canton is, or was, its prison. In that part of the prison called the Wee-ki the prisoners (1872) were kept in separate enclosures: thirty or forty persons confined in spaces not more than fifteen to twenty feet square. The men were in filth, rags and misery; the stench from them most offensive. Among them fever was rife; but, it is added, under these conditions some of the old prisoners lived and throve; while the new prisoners, unaccustomed to the atmosphere, often died.

296 Of Pakhoi, it is recorded that the town, from its filthy state, is unfit for Europeans to live in. The plain by which it is surrounded presents many advantages as a site for

residences. In the streets there is no attempt at cleanliness. Open gutters run through most of the houses, and into them every kind of refuse is thrown. Lastly, the city 67
of Hoihow, situated on the island of Hainan, compares favourably with cities in China proper. The streets are well paved and drained, and householders subscribe to keep the drains in order. Foreigners reside in the city, their houses of two stories in height, while those of the natives consist of one only. Within the distance of a few minutes' walk there is an elevated piece of ground, eligible as a site for houses for the foreign element.

Disposal of the Dead.

With few exceptions, extra-mural burial is insisted on 2
in China. In some localities the dead are interred at considerable depths ; in others, the coffins are deposited on the surface of the ground, until the elements, time, and accident, produce their effects. In fact, the neighbourhood of cities is often a huge necropolis ; the sights presented by them being extremely horrible. Elsewhere, regular burial-grounds occupy picturesque positions ; as in life parents are "honoured," so in death homage is shown to ancestors, and once a year visits and pilgrimages to their tombs are made. But previous to interment, the bodies of the dead are retained sometimes for a year or even more in the family dwelling ; the coffins so completely closed, however, that evil results are not assigned to this practice of a protracted wake. A special official, whose duties combine those of coroner and registrar of deaths in this country, takes cognisance of all deaths. From him it is necessary to obtain a certificate that death has arisen from natural causes, in order that the funeral *cortège* may be permitted to pass through the city gate on its way to the tomb. In the absence of that certificate, the coffin is handed over to "the proper authorities."

Dress.

The dress of the Chinaman varies according to season. His long loose habit is well adapted to warm weather; and to every article of wearing apparel he, whose means permit him to do so, pays a wise attention. In summer he wears a silken net upon his skin; which, interposing between his surface and his next garment, relieves him from the inconvenience of copious perspiration. His shoes during that season are neatly and airily made of weaved rattan; in colder weather, of silk and felt materials. Their soles are of considerable thickness; they are usually made of pressed paper, manufactured from the bamboo, or of old cotton cloth or felt. In winter, loosely made boots, reaching midway up the leg, are worn; they are rendered waterproof, and may be described as combining comfort and usefulness to a degree unknown to wearers of foot-gear according to Western notions of such matters. The Chinaman wears a light cap, ornamented, and in his hand carries a handkerchief or fan—the latter being not only useful, but also a formal article of dress with him.

In winter he wears an upper garment, lined throughout with fur, the hairy side of which they turn outwards. Furs
4 indeed are worn in China to an extent that is unknown in the Western world. In a northern winter, when a European would be suffering intensely from the cold, a Chinaman, thanks to his costume, enjoys perfect comfort and warmth, the fur lining of his winter dress more than compensating for the absence of stoves and grates. The poorer classes wear padded garments. All are destitute of shirts, flannels, and anti-cholera bands. They take off or put on an additional garment as occasion requires. Thus, from a state of very pronounced *déshabillé*, to one equal to the multiplicity of vestures represented by the grave-digger in "Hamlet," the transition occurs according to season. In the hottest period of summer and autumn, many of the Chinese expose their bare uncovered heads directly to the rays of the sun. Nor do they suffer in any respect for so doing.

Food and Beverages.

The food of the Chinese is mixed, but, from its cheapness as compared with animal food, vegetable diet prevails. In the north little beef is eaten; the cow and ox are regarded as semi-sacred, and among the Buddhists the slaughter of cattle is forbidden. The chief animal meat used is mutton and pork; and with regard to the latter the remark occurs that—"If filthy feeding of pigs induced trichina, the most disastrous effects would be seen, for pig life is simply revolting." Trichina in the flesh of these animals has been detected by the microscope; but, according to the reports before us: "Pork is eaten by the natives thoroughly cooked, and cooked in very small pieces. Cooked thus there can be little danger; but a roast leg of pork cooked in foreign style would certainly be a most dangerous dish." No small 50
number of the labouring classes live exclusively on rice, fresh and salted vegetables, and a small allowance of salted fish. Still lower in the scale are numbers to whom rice even is a great luxury; whose diet consists of little more than sweet potatoes, and salted vegetables without any intermixture whatever. Some of these are too poor to be able to purchase salt to flavour this scanty fare, or firewood wherewith to cook it. The ordinary Chinese takes two meals daily, composed chiefly of rice or flour, and a little vegetable. Heavy dinners and copious vinous potations are to him unknown. Raw vegetables, as also those that are pickled in salt or vinegar, are freely partaken of. Fruit, ripe and unripe, raw and cooked, is also indulged in; so are confections, when these can be afforded. His ordinary beverage, hot or heated water or tea—weak, very weak—and without either sugar or milk; in fact, the latter product is altogether avoided as unclean by the Chinaman.

The beverages of the Chinese continue to be what they were described by early travellers to their empire: "They drink their liquors, which are generally made of beans, tea, or water, boiling hot in the heat of summer, wine only excepted, which is drank naturally. They find by experi-

ence that such hot liquors are very good and 'comfortable for the stomach,' being 'very great cordials and strengtheners of the inner parts.' To this they attribute their long lives and health, being very brisk and lively at seventy or eighty years of age. And indeed," says the writer quoted, "by this means I conceive the *Chinese* are preserved from the stone in the bladder, wherewith a very great part of the people of Europe are very much afflicted, and which divers learned men have believed to proceed from no other cause than their continued drinking of cool drink." * "Their ordinary drink is water in which tea has been steeped." †

WATER.

Very great contrasts exist between the quality and source of supply of the water used as an ordinary beverage, and for culinary purposes in different parts of China. As a general, but by no means invariable rule, a Chinaman, as already observed, drinks only water that has been boiled, it having in the first instance been purified by the addition
2 of alum, and filtered. In 1871 this was the report on the water supply of Peking: "The chief water supply comes from the *Kwen-ming* lake, near the Yuen-ming-yuen gardens, and it is again supplied by springs in the neighbouring hill to the west. It is sweet, soft, and pure, and equal, if not superior, to the water of Loch Katrine." In addition to these sources the supply is increased by means of springs and an aqueduct. At Newchwang
1 almost all the drinking water is obtained from surface ponds, and is frequently used without being either boiled
16 or filtered. At Chefoo nearly all the plain surrounding the town is one great graveyard, through which the water must percolate into the wells; and besides this, the extremely filthy habits of the people lead to still further

* De Boyer and de Keyser's Account of an Embassy to Peking 1669, p. 174.

† Ibid. p. 176.

contamination of the water by matters in themselves most objectionable. Old residents are said to suffer little inconvenience from the use of such water, but in the case of new arrivals it induces diarrhœa.

At Chinkiang the major part of the water-supply for both foreign and native communities was procured (1877) at a point but a few yards removed from the mouth of the main sewer, and which is a favourite rendezvous for native boats. These causes, it is stated, render the water there procured a source of disease hardly to be appreciated after long years of immunity, but nevertheless dangerous. At Shanghai, nearly the entire water-supply is obtained from the adjoining river and the Soochow creek. Much putrefying matter is necessarily washed into them by every shower of rain. From foreign ships and native boats, a considerable amount of fæcal contamination takes place. This water is drunk, after filtration, the addition of alum to it and subsequent boiling. At Wenchow the people are careful as to the water they drink. They draw their supply for drinking and culinary purposes from places as remote as possible from habitations, these wells secured by encircling walls closely cemented, so as to keep out the surface-drainage. That for washing and for ablution is taken from canals.

At Canton, according to the reports before us, large numbers of the native population (in 1872) used water charged with the impurities of human excreta; that used by the boat-population is extremely filthy; but beyond all in abomination is the supply obtained from the Shan-t'sung creek, for a description of which, see No. III., page 21, of the series of Medical Reports already referred to.*

* The Shan-t'sung creek "is not far from the foreign settlement. It is comparatively narrow, and crowded with boats; on both sides of it are innumerable houses, chiefly brothels; the alvine dejections and other impurities of thousands of inhabitants along it are daily discharged into the stream; yet the water, too dirty even for washing, is daily used for culinary purposes, without being filtered or precipitated with alum. "Here," the reporter adds, "we should expect the prevalence of such diseases as typhoid fever and diarrhœa occurring often enough to excite attention;" but—the reporter learnt that—"these

67 Although at Hoihow on the island of Hainan the water obtainable from the wells is brackish, and in other respects not desirable, the natives make use of it, and of "foul water close to their dwellings," rather than that which is yielded by excellent fresh wells situated at an inconsiderable distance from their houses.

HABITS.

The Chinaman at home is regular and systematic in his habits. He rises early; he works at his business until late at night; he takes brief intervals for his meals, but knows no holiday nor "day of rest." He is friendly to strangers whom he knows, and hospitable. He practises "personal hygiene," inasmuch as he indulges in no excesses; he avoids contentions; he is not led away by scenes of excitement; he adapts his clothing to climate and to season. He is for the most part temperate in regard to drink as well as food. But he is by no means an abstainer. Like most other natives of northern countries, the inhabitant of Pechili and adjoining provinces indulges, more especially in the winter season, in hot spirits or shamshu. Unhappily he suffers in health as a consequence, a particular form of dyspepsia,
4 called *Ye-ko*, being induced thereby. Generally speaking, however, it may be asserted of the Chinese that, "leaving
214 opium * out of our calculation, they have found out the

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people are not more subject to fevers and other diseases than are other persons, and this immunity is one of the reasons for their continuance in the use of such water. A detailed examination of this creek, and the disgusting habits of the inhabitants," he adds, "would almost unsettle one's idea of the connection between typhoid fever and polluted water."

* The much debated subject of opium being mentioned as above, I may observe that in so far as the question of its use by the Chinese comes within the scope of medicine and hygiene, it is somewhat fully discussed in the reports referred to marginally in the text. The moral aspect of the question is considered to be beyond the intended scope of my present remarks. The following extract from a report published since my Epitome appeared may be given in this place, as it brings the question down to the latest available date, namely :—Mr. Consul

secrets of long and healthy life in tropical regions, namely, keeping cool, being moderate in diet, and cultivating tranquil habits of body and mind." Public baths exist in northern 4
cities, and to these places the people largely resort. Unfortunately, however, those places of resort are by no means kept in that condition of good order that they might be expected to be. The water in them is made to look anything but inviting after it has been made use of by a large number of persons ; and there are reasons for the belief somewhat generally entertained that public baths, more especially in northern cities, tend to spread some of the forms of skin disease so commonly met with there. The Chinese indulge freely in the application of warm water to the surface of the body in ordinary ablutions, but object to that which is cold. Many will freely wash the upper part of the body, but decline to extend ablution to the lower, lest the "vapour" from the latter should ascend to and injure the former, and, according to their philosophy, "the nobler part."

Spence writes : "In no other province except Hunan did I find the effects of opium smoking so little perceptible as in Szechuen." Mr. Baber says, "Nowhere in China are the people so well off or so hardy, and nowhere do they smoke so much opium. Mr. Spence found the people of Szechuen stout, able-bodied men, better housed, clothed, and fed, and healthier-looking than the Chinese of the Lower Yangtze. He did not see among them more emaciated faces and wasted forms than disease causes in all lands. There are some whose health was completely sapped by smoking, combined with other forms of sensual excess ; and no doubt there are others weakened by excessive smoking. But the general health and well-being of the Szechuen community is remarkable."—(*Chinese Consular Reports*, 1881.—Ichang, p. 36.) With regard to the use of this drug we also learn that : The leavings of the rich smoker are mixed with the opium sold to the poor ; the refuse of the poor is smoked by him again, and the unsmokeable dregs are drunk in tea by labourers, sailors, and others who have not time to knock off work for a smoke. According to the reports before us, the use of opium in the form of smoking is, in malarious localities, believed to act as a prophylactic against periodic fevers incidental to such localities. But at Wenchow, when, in the half year ending March, 1878, cholera prevailed, it is recorded that "opium smokers, if attacked by that disease, almost certainly died." (Epitome, p. 215.)

Among the Chinese, crime of a serious nature is comparatively rare; a circumstance believed to be due, rather to the habitual deference which, as a people, they pay to constituted authority, than to the efficiency of their establishments for the repression and punishment of offences. Punishments, when inflicted, are of very great severity; they extend from the application of the bastinado and "cat" to mutilation and death.

32 With regard to the habits of the lower orders of foreigners, they resemble the habits of similar classes at all seaport towns, only the evils of those habits are increased in China by the violence of solar and malarial influences, superadded to the effects of intoxicating drinks, nearly always of most inferior quality and frequently adulterated with more or less deleterious substances. The better classes of residents are careful in regard to diet and shelter; they sleep on the upper floor of their houses, and, as a very general rule, they avoid excesses at the table—certain American drinks notwithstanding.

A Chinaman manifests what to us appears a very remarkable indifference to bodily suffering, and even to death. This characteristic is the result of careful training in this respect; and it operates without doubt very much to his advantage in times of sickness, and when suffering from accidental injury of a severe nature. It, moreover, has the effect of bracing him up against the various causes of illness, and the different other evils to which as a member of humanity he is liable. Might a lesson not be taken by some among ourselves from the habits of the Chinese thus noticed?

Under this paragraph it is convenient to refer to the practice which prevails in some parts of China, of cramping the feet of young girls. This method of producing "fashionable deformity," appears to prevail to a greater extent in the north than in the south of China. The process is ordinarily begun when the child has attained the age of five years. It does not appear to be attended by any considerable degree of pain, nor does it prevent children undergoing it from indulging in the usual games of their

time of life. In the case of the labouring classes the foot thus contracted and artificially deformed becomes predisposed to disease of the bones connected with it, more especially in women whose avocations are such as to necessitate much walking.*

Benevolence.

Benevolence and Charitable Institutions are fostered and maintained by the inhabitants of China. Good acts are inculcated as proofs of religious sincerity. Alms, consisting of rice or clothing, are frequently given ; and it is stated that the modes of collecting the poor tax are very direct and economical, bringing householders into contact with the beggars in their neighbourhood, but offering no rewards to tramps or idlers. Among public institutions for various classes of needy persons are retreats for aged, infirm, or blind, orphan asylums, and lazarettoes. Unhappily, the usefulness of these institutions is in some instances vitiated by mismanagement ; and from the same circumstance the rate of mortality among their inmates is very high. But the fact of their existence deserves to be noticed. So also does that of Humane Societies for restoring the drowned ; associations for giving decent interment to the poor ; soup-kitchens ; societies for providing shelter for vagrants and outcasts who have been suddenly reduced to penury ; for the relief of indigent and virtuous widows ; and a kind of savings-banks, for the purpose of aiding a man to get married or to bury a parent, also exist.†

In times of great sickness, medical attendance and medicines are provided at the expense of the State ; the dead are interred at the public expense. In times of dearth

* The actual cause and origin of this custom, strangely enough, do not appear on reliable authority in Chinese history. According to one account it was first adopted by Ta chia, wife of the Emperor Chei or Cheou, about B.C. 1150. By other authors, it is said to have been introduced by Yao Niang, concubine of Li Yū, about A.D. 970.

† Williams, vol. ii., p. 266.

and famine, soup-kitchens, and relief in money and in kind, are provided for the necessitous. Public establishments exist, at which vaccination is gratuitously performed.*

In the early part of the seventeenth century, there existed on the river Amoor, a station to which certain criminals were sent. As they behaved well, the Emperor forgave them their crimes, remarking that "if criminals have a path of self-renovation left open to them, there is reason to hope that they will reform, and become virtuous." † This sounds not unlike the voice of philanthropy as heard even in our own land.

HEALTH-CONDITIONS.

The health-conditions of the several Concessions and Treaty ports differ greatly among themselves—a circumstance to be anticipated, considering the great range, geographical and climatorial, over which they extend. Of Peking it is recorded that, "With all our filth, dirt, and smells—and people in the West can form no notion of what they are, for they defy description—there is wonderful immunity from fevers, and in other respects the city is by no means unhealthy as a place of residence; in fact, the death-rate among British residents generally does not exceed that of all England.

9 At Tientsin, the general health continued good, with occasional recessions in particular seasons. At Newchwang a very remarkable condition of body is described. "Life"
282 at that place is decidedly "slow;" the resident chafes that he has insufficient work; unless he takes continuous exercise he suffers from nervousness of a most painful nature, only to be dispelled by hard work, or by a trip into the interior
284 of the country (South Manchuria). Yet there are few places where a healthy constitution intelligently cared for is more likely to enjoy health than here, or few places more likely rapidly to destroy life, where the constitution is weak, in which there is hereditary taint, and where the

* Williams vol. ii., p. 266. † Gutzlaff, p. 93.

utmost care is not bestowed upon it. In the reports before 14
us, however, repeated allusion occurs to the great risks of death incurred by missionaries and by "sisters" in China, these risks being due to the duties they severally perform in relation to the sick and to the abject poor. At Chefoo the 17
risk of life is said to be no greater than it is at home. At 20
Chinkiang the state of health seems to vary from year to year. As examples, we read that "it was good, yet scarcely an individual of the foreign community has been unaffected with some form of disease more or less grave." The health was fairly good; the health of the foreign community was not good; it was unusually bad, and so on. At Wuhu 22
it was scarcely satisfactory. At Kiukiang, it was stated 24
that there was little sickness, that the health was good, 25
exceptionally good, &c. At Ichang the health of foreigners upon the whole was good, a circumstance the more remarkable, as at the date referred to (1880), the majority 31
lived inside the city. At Shanghai it is stated, with 35
regard to healthy years, that, presuming ordinary care to be taken, nobody diminishes his chance of life by removing to that port. There are even certain diseases constantly present in England which a few years ago were unknown in Shanghai (1872); among them diphtheria, croup, scarlet fever, true measles, and laryngitis. Unhappily, at that port the rate of mortality among European children is for the most part comparatively large. The tropical heat of the place during summer interferes with the growth and development of adolescents. Medical men on the spot accordingly deprecate the retention of children there for a longer time than is actually unavoidable, as also the system of sending out young men who are still growing, to encounter the constant work of a Shanghai office, and the vicissitudes of a Shanghai climate. In other years the rate of mortality among foreign 36
residents between the ages of twenty and thirty is much higher than it is in England. The ratio of deaths from diseases of the heart and blood-vessels to all other diseases far exceeds the same ratio in this country. Against this, however, there are many foreign residents who have lived

twenty years and upwards in China, and of whom the majority would compare favourably for strength and activity with a like number of the same age taken from the desks of London offices. Great hopes are expressed that by means of a Temperance Society, established at Shanghai some years ago, good results in regard to health will tell more and more upon the sailors who visit that port, and also upon the constantly-increasing body of Europeans who pick up their living "somehow."

42 At Wenchow, foreigners scarcely if at all experience the degree of depression and languor complained of so much in most up-river places; and, thanks to the sea breezes, general good health prevailed among them. The natives, however, in physique compare unfavourably with those of other parts of the Chinese empire; they suffer greatly from intermittent fever. They are described as being of insignificant physiognomy, and as "small brained." Fewer of them attain to seventy years of age than in the adjoining departments, and it is seldom that their scholars succeed at the provincial examinations.* They are largely addicted to the use of opium.

44 At Foochow, foreigners enjoyed a high standard of health, and there was reported to be among them a remarkable freedom from epidemics. On at least one occasion the death-rate among Europeans was not higher than that
47 of the healthiest districts in England. The diseases of ladies and children were described as having been "largely unavoidable, because essentially climatic; but the diseases of men were in a great part not so." Those who observed
50 moderation in all things were the most healthy, and of
47 them, chiefly the oldest residents, for the reason that for the most part they were on their guard against undue exposure to the sun, atmospheric changes, and excesses of all kinds. The benefits conferred upon sailors in respect to health by the Shipping Act, of 1867, are particularly

* Note what has already been stated in reference to the "sanitary" conditions of Wenchow, *ante*, p. 209.

noticed. Among those who visit this port, scurvy had decreased (1875) by 80 per cent.

Notwithstanding the conditions of the city of Amoy, already described, the Chinese of that place live and thrive where, as the reporter observes, an Englishman would hardly dare to 54
lodge his pigs. The city is full of typical fever dens, yet there is no typhus, typhoid, or other disease usually considered to be the inevitable results of such conditions. According to Reports on this settlement :—"Luckily filth, 58
overcrowding, and bad food, are not the only factors necessary for the manufacture of a typhus epidemic; were they so, we should live in Amoy in perpetual dread. 59

In the Island of Formosa foreigners suffer to a considerable extent from malarial diseases, more especially during the hot months of the year. In 1877 cholera did not occur, notwithstanding that it was epidemic in various localities on the mainland. Judging from the physical appearance of the adjoining small but rocky island of Lambay, it ought to be the reverse of malarious; yet, on it, malarial fevers are exceedingly prevalent. The chief causes of inconvenience experienced by residents at Tai-wan-foo are the difficulty in obtaining food other than poultry, fish, and intermitting supplies of inferior beef, and the sense of isolation from the rest of the world that comes over them at times. Fortunately there are few places where the *entente* between Chinese and foreigners is more declared than in Formosa. What are called the savage races of the island, namely the aborigines, freely seek and make use of Western medicine.

At Swatow, delicate persons, children and adults brought 60
to that place from other ports in China, quickly gain strength in a number of cases. During the winter months, too much 62
cannot be said in praise of its healthiness. At Canton the long continuance of the rainy season is trying to persons who are liable to rheumatism, neuralgic affections, or pulmonic complaints. The health of the Chinese population is generally good, except that there, as throughout the province of Quang Tung, leprosy is endemic. Here, also, the

extent to which enthetic diseases prevail among the native population is described as frightful.

66 Pakhoi is an unhealthy residence for foreigners ; malarial fevers are common, and boils are of frequent occurrence. The natives of the place have an unhealthy look, and many
296 of them are affected with scrofula. A similar remark applies to those of Hoihow. The foreign residents, who lived in Chinese houses, had an enfeebled look, from the combined
68 effects of protracted heat, constant profuse perspiration, and sleepless nights.

Health of the Native Chinese.

The relation which exists between the physical condition of man and the region he inhabits has for many generations
4 been understood. According to native writers :—"Man is in more respects than one the mere expression of the soil on which he lives." "The local causes producing and influencing epidemic and endemic diseases are endemic atmosphere, water supply, social habits, solar influences, geological conditions, degree of cultivation of the soil, population, prevailing winds, &c." In reference to the in-
274 fluence of such conditions upon physical development and character of men, this statement occurs :—"Southern men in China are thin, spare, delicate, small boned, white skinned, with blood of inferior quality ; subject to diseases of asthenic type. The lands are watery, producing chiefly rank vegetation ; while fish abounds. Rains are frequent, saturating the earth, and rendering vegetables succulent, so that they fail to supply their eaters with sufficient nourishment ; hence they become enervated old men, contract fevers, and, not having sufficient vital power, die in consequence ; their young men fail in the struggle with inward heats, consumptions and hœmorrhages. Northern men are, on the contrary, tall, strong, able bodied, with thick red skin, large strong bones, and rich crimson blood. Their lands producing cereals and hardy woods, their food is grain and the flesh of wild beasts, and they drink wine ;

this gives vigour to the system. Cold winds blowing, and snow and ice abounding, make them bold and hardy. All their diseases are of an acute, inflammatory type, and the same general principles will apply to foreigners under similar conditions. In reference to these remarks, the author quoted from observes that:—"Looking to the Chinese themselves, we may deduce from their experiences and opinions truths which, without their testimony, we might be long and bitterly learning."

The mortality of the Chinese in large cities has not been affected by population in the same ratio as occurs in Western cities. The very men who are employed in carrying ordure from streets to fields are physically strong 6
and healthy. Beggars, a numerous class, sleep in the streets nearly all the year round, they congregate in the centre of the population, and to some extent contest with dogs the priority of claim to the refuse of the dunghills; and yet the strictly professional ones look fat and sleek.

Observers allude to the severe and extensive nature of 11
injuries the Chinese are capable of sustaining, and from which that people recover, with a fair degree of health and strength, a circumstance assigned to the simple diet of the masses, and to the phlegmatic temperament of the race. To these assigned causes it is right to add the moral 13
training already alluded to, by means of which pain and suffering come to be habitually resisted. They enjoy an immunity from disease which, considering their indifference to healthy conditions, is, from our point of view, very remarkable.

Nursing of Children.

Throughout China, the proportion of European mothers 220
who are able to wet-nurse their infants to the number who are unable to do so is very inconsiderable. Statistics on this subject, taken at Shanghai, may be accepted approximately for all other settlements, namely, of forty-one who gave birth to mature infants, twenty could not nurse them at all, two nursed them for about three weeks, and fifteen for more

than three months. Statements also occur, that in China it is rare to find a foreign mother who is capable of nursing her child, although the attempt to do so is often made by ladies. In the south of China more especially, foreign women are unable to nurse their infants, either on account of insufficiency of milk, or of insufficiency of nourishment in the milk. Fortunately for the sake of women and infants concerned, native nurses can be obtained from the agricultural population, and their employment, whenever practicable, is recommended by the medical men whose reports form the basis of the present remarks.

Theories of Disease.

400 From very ancient times, Chinese physicians and philosophers have entertained very definite, and, according to their own estimate, very correct views in regard to the origin of diseases, by which, in succession, one generation of humanity after another passes away, to be in turn succeeded by races of people no less fleeting.

About B.C. 2700, Hoangti, the Yellow Emperor, is recorded to have observed that man suffered from without by the rigours of the season, within by the passions which disturbed his mind; he died before his time. The physicians
63 of the Chow dynasty, B.C. 1122 to B.C. 250, classified diseases under the four seasons of the year; headaches and neuralgic affections under *spring*, skin diseases under *summer*, fevers and agues under *autumn*, bronchial and pulmonary complaints under *winter*.

270 The Chinese physiologists expressly call man "a little microcosm, or universe, and to this microcosm they apply their doctrine of the *yang* and the *yin*—otherwise the male and the female principles of nature. Nor is the action of these two principles limited to the microcosm man; it extends throughout the macrocosm of the universe, the outline of which was first formed by them, while they were influenced by their own creatures.*

* Williams, vol. ii., 138.

When a disagreement between these two principles takes 272
place, the result comes to be disease, local or general, as 118
the case may be. In a case of intermittent fever, for example, the *yang* represents the hot stage, the *yin* the cold. When the *yang* is conquered, the *yin* prevails, and ushers in the shivering stage. When the *yin* is weak, there is great external and internal heat.

In the thirteenth and fourteenth century of our era, the 124
disease cholera was assigned, among other causes, to the circumstance that the *yang* principle ceased to ascend, the *yin* to descend, the diaphragm being in consequence drawn 75
down. Small-pox and measles, according to the Chinese, depend upon a poison inherited from the parent, and which resides dormant in the system until developed "by external exciting causes," "like fire generated in the flint." "The air of the seasons" is believed to be one of those 1
exciting causes. Two theories regarding the causation of fever successively held sway in ancient times. According to one of these, that form of disease arose from "the vicissitude of the seasons;" according to the other, the several types 274
depended upon the presence in the system of a "specific poison." Their code of therapeutics indicates the practice of Chinese physicians in ancient times, in accordance with 69, 226
the humoral theory, that of germs, *similia similibus*, &c., 230
also their acquaintance with anæsthetics. 231

Many generations before "life pills" were invented in our own civilised and advanced country, the Chinese 227
employed "infallible specifics" for procuring longevity; that remedy the "pine ceiling dew." They had also their liquor of immortality, by which he who partook thereof quickly passed from the cares and troubles of this world to the enjoyment of eternal life. Prosaic people said of this famed liquor, that its less poetical name was "poison."*

* The theory expressed in the text is by no means without its counterparts among the many hypotheses of disease which have—each in its turn—prevailed in Europe. For example in the sixteenth we had that of "Natura morborum medicatrix;" in the seventeenth that of an "archæus" directing the bodily functions; that of the

Measures against Pestilence.

70 The measures adopted by Chinese sanitarians, ancient and modern, against the spread of pestilences may be alluded to thus :—The origin of epidemics was and indeed is on occasions still referred to demons of pestilence. Temples in honour of "the mighty ones," as these demons were respectfully called, were raised, and in them certain ceremonies performed, with the result—so we learn—that formerly the outbreak ceased; but that in more recent times the issue has been less successful. In the instances where success did follow this important sanitary measure, the natural period of decline and cessation of the epidemic coincided with the performance of the ceremonies
70 to which the credit of "stamping it out" was assigned. According to the Pent'sao, one of the oldest, if not the most ancient work on medicine in China, old clothes are included among the poisons, for the reason that they were
11 considered to carry the "germs" of infection; their conveyance from an infected to an uninfected place was accordingly interdicted. As in Western and so-called more *civilised* countries, epidemic frenzies have occurred in China from time to time. The means by which they were met consisted for the most part of incantations, talismans and charms of various kinds; branches of the peach tree were hung over the door; by means of gongs, drums, and fireworks, the demons of pestilence were driven off. In the West fires are lighted, and by their means the air is "disinfected." Demons of pestilence are now deposed. In their stead, and for the time being, microbes hold high revel.

"Iatro-mathematical school;" that of "relaxation and tension." In the eighteenth, of "irritability and sensibility," and so on. With regard to the nineteenth century, the question may perhaps be not inappropriate :—Is it not as yet somewhat early to assign the prevailing theories of "specific poisons," microbes, bacteria, et cetera, as causative agents of diseases to the category to which belong the *yang* and the *yin*?

Rules for Maintaining Health.

In the reports submitted by medical officers at Treaty ports, valuable remarks occur in reference to the means of preserving health, more especially in regard to foreign 32
residents in China. A few brief extracts on this part of my subject must here suffice. In summer, when exercise cannot be taken, there continues to be constant exhaustion of the vital energy due to extreme heat. This condition of the body requires the use of sustaining food. The loss of fluid by perspiration, though partly balanced by diminished elimination from the kidneys, demands a large amount of drink, and doubts are expressed as to whether the quantity of alcohol that most people take is really hurtful. Medical men on the spot write: "It is certain that occasional stimulation is necessary, and it is within the experience of every one, that when exhausted by any kind of work, with the thermometer at 90° Fahrenheit or upwards, food, the sight of which excites loathing, is, after a glass of sherry and iced water, or a little brandy and water, eaten with relish, and easily digested. It enables work to be done which otherwise would not be performed. But," adds the writer now quoted, "each person must be a law to himself."

Strong muscular exercise in summer is not recommended, 46
nor anything like over-training at any season; on the contrary, even when cool weather sets in, more especially in the tropical parts of the country, great caution should be observed in passing from the mild exercise appropriate to summer, to the more severe form of exertion found beneficial in winter. High training ought not to be attempted in China at all—that is, if the preservation of health be thought of importance.

Moderation in the extent of exercise taken, and in all 4
things, is recommended. It is pointed out that "those who lead inactive lives suffer from nervous ailments, and are much more affected by climatic influences than those who choose the middle course."

46 A distinction is drawn between moderate and violent exercise. Strong muscular exertion even during the cold season is not recommended, chiefly because of the increased liability on the part of foreigners as compared with the natives of the country in China to aneurism and to disease of the heart,—a liability which, apparently with a considerable degree of reason, is attributed to the violent exercises in which it is their general habit to indulge. In the change from the very mild exercise appropriate to summer to the more active form of exertion beneficial in winter, great caution is required. Foreigners should try to make the
52 climate suit them—not them the climate. They should remember that they are exotics in China ; that they must sicken and die if they do not in one way or another reproduce the circumstances of the land in which their constitutions were bred. In reference to the more southern
44 ports we learn that, "Foreigners were considered to be the better of generous diet, and a fair amount of stimulants at meals. Light claret was considered to be the best beverage. Malt liquor did well with some people, but disagreed with others. No general rule can be laid down ; each person must judge for himself. In the hot season, smoking (tobacco) except in extreme moderation is injurious. In cases of great bodily or mental anxiety, however, a cigar to the smoker is invaluable.

56 The advantages of residing in large, well-built airy houses, erected on elevated sites, are dwelt upon.

58 The practice of bathing whether in the sea or river during the hot and rainy season is attended by risk, fever, continued or periodic, being thereby induced.

61 Similar attacks occur from the practice common among sailors and passengers on coasting vessels of sleeping on deck at night. The necessity for purposes of health, of drinking pure water, and of eating food, animal or vegetable, of good quality is self-evident.

294 The clothing should be adapted to sudden changes of temperature and to season.

34 Experience of quinine as a prophylactic against malarial

fevers has not been sufficiently uniform to justify definite conclusions on the subject being drawn. Inasmuch as exposure to the sun, more especially when to that exposure is added fatigue, is a recognised cause of such diseases, they are accordingly to be avoided as far as that is practicable. The inconsiderate indulgence of "sport," such as shooting in swampy localities, has led to attacks of fever, and permanent loss of health on the part of young men, who, had they exercised discretion in this respect as in others, would in all probability have continued strong and robust.

Sanitaria.

In the near vicinity to certain Treaty ports there are localities more or less elevated to which foreign residents resort during the hot and most trying period of the year, or send their wives and children, much as our countrymen and countrywomen in India utilise the beautiful and gay hill sanitaria of our great dependency. At Kai-chu, a distance 11
of thirty miles from Newchwang, there is a long line of sea beach. On a rock one hundred feet high near that place, a bungalow has been erected, and thus the locality made available for visitors in search of health. Chefoo itself pos- 16
sesses all the characteristics of a sanitarium. To it, visitors resort from other ports and places in China; and patients, to all appearance seriously ill, who arrive there before the month of July, often make rapid recoveries; this is said to be especially the case with patients from Shanghai. Among the beautiful hills southward of Chinkiang, visitors may 19
wander for many miles, and while enjoying the view of very striking scenery, indulge in the sport of wild game shooting, at the same time that they renovate health impaired by exhaustive heat. Shanghai has its Bund and Bubbling Well 294
road. Ningpo has the Tien-dong or Fung-hwa ranges, the 294
beauties and advantages of which equal what one finds among the Alpine gorges or in the depths of the Pyrenees.

Mineral Spas.

There are also spas distributed throughout China, the virtues of which have been recognised for many generations
240 by the people of that great empire. Near Peking there are the famous baths, respectively sulphurous and saline at Pi-yün-sze, and T'ang-shang, their chief ingredients alkaline chlorides. Near Chefoo there are sulphur springs ; and at Loong-Chuen-Tang, thirty-three miles eastward, mineral baths. The water in them is sulphureous ; and in their vicinity "the god of healing," resides. Other baths and springs exist in the same neighbourhood. At Takow and Anping on Formosa, there are sulphurous springs. There are hot springs in the provinces of Shensi and Szechuen ; and at Jeho in Chihli. From those in Szechuen an inflammable gas arises ; it is conveyed in tubes, and utilised in various ways. The "Bubbling Well," near Shanghai, emits gas, which is said to be inflammable. The well itself is, or was some years ago, a favourite resort—not of invalids, but of pic-nic parties.

Conclusion.

Finally, I have now endeavoured to summarise a few out of many items of information—for the most part new—presented to us in the pages of the valuable reports to which, at the opening of this paper, I alluded, myself interpolating from time to time such remarks as were naturally suggested in the process. Whatever imperfection appears in the general arrangement is mine ; whatever degree of interest and usefulness the remarks now made possess, belongs to the authors quoted.

NATIONAL EDUCATION IN CHINA.

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NATIONAL EDUCATION IN CHINA.

THE rise and progress of the Educational System of China is a subject full of deep and varied interest to all students whether of history or of politics. To the historical student it affords that interest which cannot be disassociated from an institution whose gradual growth and development can be traced back through the vista of ages to almost the very dawn of history. To the political student it affords the interest inseparable from a system which supplies the explanation of curious problems of constitutional history, which, by adopting competitive examination as the surest discrimination of merit, had long anticipated the West in the solution of at least one educational difficulty, and which perhaps may afford her assistance in solving another difficulty, which—though as yet only as a cloud the size of a man's hand—is already looming upon the horizon and appears pregnant with serious issues in the near future.

The dangers of destruction to which all records in the ancient past were exposed would, in the case of any country whose existence dates back to such remote antiquity as does that of China, render an attempt to trace the history of its institutions through tens of centuries to their birth and origin in the infancy of mankind no easy task; but in China these unavoidable dangers have been largely supplemented by an act probably unparalleled in the world's history, the deliberate attempt made by a monarch, as was made by Shih Hwangti in B.C. 213, to destroy the entire records of his country's history prior to his own time. Had

printing been then invented, or even paper and the present mode of writing which date from this reign, been long in use, such an attempt would have been but folly. Still without these facilities for the dissemination of knowledge, or perhaps in consequence of their absence, the study of ancient works had reached such perfection, that though a period of anarchy extending over one hundred years succeeded this reign, and though it was only towards the close of this period that serious efforts were made to recover the literary treasures destroyed, yet a very large portion, if not the bulk, of the works most highly esteemed was re-written from the mouths of scholars who had committed them to memory ; and upon the demolition of the buildings over Confucius' tomb, it became possible, by means of the manuscripts discovered there, to check and even amplify what had been already recovered. Large portions of the ancient literature were naturally lost beyond hope of recovery, and those which were collected and accepted as authentic were, it is argued by some critics, involuntarily modified by the practice and opinions current during the period in which the collection was made. Even if this be the case, still in the works of Confucius and of Mencius, in the "Book of Ceremonial" and in the "Ceremonial of the Chow dynasty" as they have come down to us, many observations upon the system of these ancient times are to be found. And the materials collected from these and other works in the magnificent encyclopædias which form so conspicuous a feature of the bibliography of China, render it possible to reconstruct at least in general outline the system followed prior to the first century before Christ, since which date the records at disposal, as collected in the encyclopædias, are exceedingly voluminous. Deeply interesting as a study of these records would be, to attempt to trace the gradual growth and development of national education in China is altogether beyond the bounds of possibility within the limits of a single lecture. All that can be attempted is to touch upon the most salient points in its history, to give a brief sketch of the system as at present existing, and to

draw attention to some of the principal problems which it solves.

Mencius (about B.C. 320), when instructing Duke Wên —a petty principality situated in the present province of Shantung—in the duties of good government, insists upon the necessity of fostering education among all classes, and appeals to the practice of the earlier dynasties. His enumeration of the names by which schools were known under each does not quite agree with those given in the "Book of Ceremonial," but the discrepancy is not perhaps to be regretted because it is an evidence of independent origin and consequently of authenticity. From a comparison of these statements it appears evident that schools were in existence certainly as early as B.C. 2205, perhaps even as early as B.C. 2852. Down to B.C. 1122 the main object of instruction was to develop proficiency in military arts and to inculcate reverence for superiors. After that period, under the Chow dynasty, the scheme of education appears to have been much enlarged and systematized. Boys then entered school at eight years of age, and during seven years received instruction in deportment, and etiquette towards superiors and guests ; in ceremonial, music, archery, horsemanship and chariot-driving ; in reading and in writing. At fifteen they passed into the High School, the studies in which were mainly intended to fit the individual to perform his duties in his corporate capacity as a member of the State and in his private capacity as a member of the family in such a manner as would best conduce to the welfare and peace of the Kingdom. The directors of public instruction in the Capital were maintained at the expense of the State, but in the department centres these duties appear to have been undertaken by high officers who upon retirement from the public service returned to their native towns. In the Capital also there was a special college for the training of Imperial Princes and the scions of nobility : and elevation to rank was determined by merit only. This policy undoubtedly raised China to a high state of civilization and the institutions then established have served as the

models upon which those of all subsequent ages have been based. But by the seventh century B.C. the power of the supreme house of Chow had become little more than nominal, and that of the several tributary states had increased in corresponding ratio. Position and power were no longer determined by merit, but had become hereditary in some of the dominant families: schools ceased to exist, and culture and learning had in consequence fallen to a low ebb. From every point of view the tendency of the time ran in the direction of repressing rather than of fostering the means of education and improvement. Yet during that stormy period were born two men who have exerted an influence greater than all others combined upon the history and educational system of China during nearly 20 centuries, and who have no reason to bow their heads before their contemporaries in any part of the world—Confucius who was born B.C. 551, and Mencius who was born B.C. 372; while a third, Laotze a contemporary of Confucius, founded a school of philosophy which, owing to its vague transcendental character and to the theories of alchemists which were subsequently engrafted upon it, threatened some 12 centuries later under the Tang dynasty to oust the followers of Confucius and Mencius from the position they had occupied before and have uninterruptedly occupied since, as the moulders of all literary thought in China. Shortly after the close of this long lived dynasty followed the attempt to destroy the literary records of the past already alluded to; but the itinerant schools formed by Confucius and Mencius had made acquaintance with the works of these philosophers so general that they were graven rather in men's minds than on the tablets it was sought to destroy. The attempt failed and met its reward in the overthrow of the Ch'in dynasty. The succeeding dynasty, that of Han, had been compelled, when establishing its power, to rely largely upon the support of the feudatory princes, who in their turn showed an ever ready desire to avail themselves of the disturbed condition of the empire to extend their dominions and authority; and when the suzerain was enabled to curb

these grasping tendencies and to clip the power of his feudatories by the aid of the literary classes and their appeals to the practice of the Chow dynasty when at the height of its power, he showed his gratitude by throwing in in his lot with theirs.

Appreciating the advantages he might gain by appeals to antiquity, he made no effort to introduce anything new, but strained every nerve to recover as much as possible of the literary treasures which had been sacrificed by the vandalism of the preceding dynasty. Thus it came about that weight was attached not to the practical instruction of the young in such matters as would best fit them to perform their duties in any capacity, private or official, that they might be called upon to fill, but to familiarity with the ancient books and to ability to interpret their meaning. The education adapted to mould a man for the due performance of his duties in that state of life in which his lot might be cast was discarded in favour of a knowledge not of men, but of books ; and the standard of ability and distinction thus fixed has been rallied to and maintained by every succeeding dynasty. That the knowledge of books and of ancient literature was good in itself and deserving of being fostered admits of no doubt. But to produce good results it should have been not the end and ultimate perfection of study, but a means by which to profit in order to the production of greater results. Being, however, adopted as the one touchstone of literary merit, and originality of exposition having been more and more discountenanced as time progressed, men's minds have been thrown back to an ideal in the past which they may imitate, but can never hope to attain, much less surpass ; they have been confined within a groove of archaism and conventionality which renders originality of thought or act an impossibility, and which has contributed more than anything else to that intense conservatism of Chinese policy and the stationary character of her civilization which, once the high standard the country had attained centuries ago was known, have been such a standing marvel to Western nations.

Serious efforts to obtain able officers were, however, made under this dynasty; the range of knowledge required was much enlarged and youths distinguished for integrity and domestic virtue were to be specially sought after. But their selection was entrusted to the local officials, with the result that favouritism became rampant and the really worthy were but a small minority. This state of things practically continued to exist until the system of competitive examination was introduced in the 8th century under the Tang dynasty. Under this and the following (the Sung) dynasty, a period of great literary activity, the system gradually took firmer root, and the subjects of examination were always increasing in number and scope. The *Yüan* made moral qualities the primary consideration in the selection of officers. Candidates had to bear a high reputation to be allowed to compete. In the examinations which took place triennially a deep knowledge of the classics was the one point insisted upon. The magistrates of districts and departments selected those within their jurisdictions who bore a high reputation locally for domestic affection, truthfulness, moral feeling and literary knowledge and whose conduct was irreproachable. These were sifted by examination and received the name of *chü jên*, "recommended candidates," because they were then sent on with a recommendation for employment to the Capital, where they were examined by the Emperor in political matters.

The magistrates gradually, however, became so easily satisfied on these points and the number of "recommended men" so great, that the Mings on their accession to the throne instituted a very searching examination, to be passed in order to obtain this title. A similar examination was instituted in the capital for those who had succeeded in passing that held in the provinces, and none but the successful in the metropolitan examination were permitted to hold office. They thus came to be known as *chin shih*, "scholars who were competent to enter upon office." In 1382 the regulations were systematized and have since then remained unchanged except in unimportant details. Before pro-

ceeding to consider in detail the nature of the three tests of literary ability to be passed by those who desire high office, the examinations for the degrees of—

1°. *hsiu ts'ai*—"Budding Genius" or Licentiate.
2°. *chü jên*—"Recommended men"—Provincial Graduate.
3°. *chin shih*—"Scholars competent to enter office"—Metropolitan Graduate,

it will be well to glance at the instruction which is necessary to enable the scholar to satisfy them.

National schools, in the sense of schools endowed or maintained by the State, do not exist in China, except in the case of those established at Peking for the Bannermen, and these have been allowed to fall into ruins and now serve little purpose beyond supplying sinecures for a certain number of professors. There is also, it is true, the *Kuotz'-chien* or "University for the sons of the State," that ancient college beside whose existence that of any other University in the world is as of yesterday. But after flourishing for more than 3000 years since its foundation under the Chow dynasty,—changing its locale as successive dynasties moved their capital, but located in Peking from the Yüan dynasty onwards—it is now little but a name, an embodiment of life in death. Free or Grammar Schools, founded not by the Government but by the private liberality of officials or gentry, exist in very large numbers throughout the Empire. In each of the towns which has been unvisited by or has recovered from the effects of the rebellions of recent years there is at least one and in some between ten and twenty. These, however, are availed of almost exclusively by the poorest classes. All who can afford to do so engage private tutors for their sons, or when such an expense is too great, combine with neighbours to engage one who undertakes the tuition of two or three families in a common class. Heads of clans also not unfrequently set aside lands or money to endow schools for the education of their own clan and to aid pecuniarily the poorer members when they have to journey to the

provincial capital or to Peking as candidates for examination.

In all schools the curriculum is the same. Foreign languages and science form no part, except at the T'ungwên-kuan or college of Peking; instruction is given solely in Chinese language and literature. But this is no small field, for the diction of essays, poems and State papers differs in each and from the vernacular, and China is comparatively as prolific in authors as in population. A short sketch of one school will therefore be applicable to all.

School education generally commences when a boy has reached his seventh or eighth year, and women being with few exceptions uneducated, he has seldom received any instruction at home. Arrived at this age, a lucky day is chosen, and, dressed in bright robe and mandarin hat, the child sets out for the village school. His first duty is to prostrate himself before the picture of the Great Sage (Confucius) and with almost equal reverence before his tutor. Then bright with promises and hopes of attaining the highest literary degree of Hanlin, he enters upon his studies. The little fellow has indeed every need of such a cheering goal ahead to sustain him during the first four or five weary years of study. During that period he has to commit to memory the "Four Books" and "Five classics," but without understanding a word of what he learns, so different is the written language from the vernacular. Having passed through this dreary wilderness he enters upon a brighter country. What he has already committed to memory is gradually explained to him. But here, too, memory is cultivated at the expense of originality of thought and independent judgment. He is not provided with a dictionary and allowed to quarry out the sense with the aid of his own brains; but sentence after sentence is carefully explained to him by his tutor in strict accordance with the views of the recognised commentators, and he has to carefully cherish this gloss as the groundwork from which any interpretation of the text he may hereafter be called upon to give, is on no account to depart. Simul-

taneously with translation the student is initiated into the mysteries of composition. The language preserving its primitive form is devoid of syntax and inflections, and the value of the words is governed not by any grammatical rules, but by their collocation and sequence in the sentence. The burden of acquisition is thus thrown almost solely upon the initiative faculty. In the case of a very large number of characters, also, usage has sanctioned certain combinations which though perhaps natural enough ages ago seem now to conform to no intelligible rule and can only be learnt by years of practice and study. These combinations the scholar is taught, and antithesis being a leading characteristic of almost all Chinese composition, but especially of certain styles of poetry, he is also taught to construct verbal parallels. Having acquired a certain amount of proficiency in this, he advances to styles which permit him a greater freedom of diction—to the *shuo t'ieh* the expansion of one idea in simple language and the *lun*, a formal discussion of a given subject framed in accordance with certain fixed rules. He is also taught to tempt his pinions into the region of poetry, the ideas of which are at times very graceful, though none but a scholar can fathom the wealth of illusion and conventional phraseology in which they are embedded. In the third stage he continues versification and advances to the most recondite style of prose composition, the *wên chang*, a species of essay very artificial in its style and archaic in form.

Supposing the scholar to be possessed of sufficient means to continue his studies to the point which will justify him in hoping to attain high literary honours, his reading during this period, though confined to the literature of China, will have been of a very extensive nature. Let us consider briefly what this would be. First come the Four Books. These consist of—

1°. the *ta hsüeh*, or "Introduction for men of mature age"; of the eleven chapters comprised in this work one only, the first, is the work of Confucius. This treats of the fundamental principles requisite in the

government of states. The remaining chapters consist of collected sayings of the Sage.

2°. the *Chung Yung* or "Doctrine of the Mean." In this "the most philosophic of the Four Books, the ruling motives of human conduct are traced from their psychological source."* It is said to have been compiled by the grandson of Confucius.

3°. the *Lun Yü* or "Miscellaneous Conversations" held between Confucius and his disciples.

4°. *Mêngtz'*, or the "Works of Mencius," consisting of conversations between Mencius and the princes and high officers of his time upon the principles of government and a variety of other subjects. The inherent goodness of human nature is a fundamental principle of his doctrines, but he teaches that man's physical, no less than his moral, nature requires careful fostering.

Having mastered these the scholar attacks the *Shu Ching*, or "Classic of History," which contains all that has been recovered of the original history compiled by Confucius from the annals of Hsia, Shang and Chow dynasties, i.e., of the period B.C. 2205 to 225; and the *Shih Ching* or "Classic of Poetry," a collection of very ancient ballads current in the petty states into which China was then divided, selected and arranged by Confucius. From these he passes to the *I Ching* or "Classic of Change," a work which is regarded with almost universal reverence on account both of its antiquity (tradition ascribes the symbols which form the basis of the work to Fuhi, and the explanations of them to the first Emperor of the Chow dynasty and his son, and to Confucius) and of the almost unfathomable wisdom which is supposed to lie concealed under its mysterious symbols —to the *Li Chi* or "Book of Ceremonial," a work which bears internal evidence of very early origin and lays down rules for the guidance of individual conduct under a great variety of circumstances—and to the *Ch'un Ch'iu* or "Spring and Autumn Annals," a history of his native state of Lu

* Wylie's 'Notes on Chinese Literature,' p. 6.

from B.C. 722 to 484 written by Confucius, to which is appended an amplification of the text by one of the Sage's disciples, Tso Ch'iu-ming.

While studying the above, however, the student reads simultaneously several other works, of which the most important are :—

the *Chow Li* or "Ceremonial of the Chow dynasty," a work which details with great minuteness the offices under that dynasty and their respective duties, and upon which is based the present division of the official administration of the Empire under the Six Boards :

the *Hsiao Ching* or "Classic of Filial Piety" by a disciple of Confucius :

the *Erh Ya* or "Literary Expositor," a valuable dictionary explaining the meaning of terms used in the classical writings. Its authorship is attributed to one of Confucius' disciples :

the *Hsiao Hsüeh* or "Instruction for Youths," a small work written by Chu hsi, the famous philosopher of the Sung dynasty :

the *Hsia Hsiao Chêng*, or "Calendar of the Hsia dynasty," containing astronomical records for 2000 years prior to the Christian era.

When these works have been thoroughly mastered the student passes on to the "Mirror of History," a Condensation by Chu hsi of the celebrated history written by Sz'-ma Kuang of the period commencing with the 4th century B.C. and closing with the end of the Five Dynasties A.D. 959. The voluminous works on philosophy and the Twenty-four Dynastic Histories in their unabridged shape form the last course of study. But in fact study is continued almost through life : the necessity for it does not cease with success even in the metropolitan examination, and if that honour be won when the recipient has passed middle life, he often prefers the company of his books to the more bustling cares of office.

While, then, the student is following his course of study

he endeavours to win success at the examinations so soon as he thinks his attainments are sufficient to afford him fair hopes of gaining it. There is no limit of age : Li-mu is said to have been deemed worthy of the highest rank, literary doctor, at the age of seven, and men grown grey in study are to be seen still competing for the lowest. The candidates present themselves before the magistrate of their district, before whom they have to write two essays explanatory of texts selected from the Four Books and a poem of six rhyming couplets : and this examination is repeated from three to six times at the option of the magistrate. Those who have come out successful from this trial are then passed on to the Prefect, a superior magistrate who has, on an average, the control of some six districts. By him they are again subjected to a similar examination and, if successful, then permitted to present themselves before the Literary Chancellor of the province, a metropolitan graduate and member of the Imperial Academy or *Han lin* who is appointed to this honourable post for a period of three years. During this time he has twice to make the round of the province, in area equal to the whole of Great Britain, and hold these examinations in every prefecture. Shut up each in a narrow cell for a day and a night, the candidates again write two essays interpreting passages from the Four Books and a poem. The number of the candidates varies considerably according to the size and populousness of the prefecture—from 300 to 400 up to as many thousands ; and the number of degrees to be issued is fixed by statute according to the population of the several districts, varying from 10 the lowest to 26 the highest, but in the aggregate scarcely exceeding one per cent of the competitors. The Chancellor spends some days in examining and sifting this mass of composition, and then publishes the final result in a class-list which is arranged by districts. The successful candidate who sees his name there among the licentiates is indeed a happy youth; he is no longer of the vulgar herd, and as, seated in his sedan-chair dressed in official uniform, he makes his round of calls to receive the congratulations and

presents of friends, he already puts forth the tender leaves of hope and in imagination already sees within his grasp the laurels of the higher grade.

The examination for this degree—*chü jên* or provincial graduate—takes place once every three years in the provincial capital and is conducted with a ceremony which enhances if possible the value of the honour won. It is conducted by a Chief and a Deputy Examiner who are especially appointed by the Emperor from the Imperial Academy, the Imperial Supervisorate of Instruction or the Court of Censorate, all members of which departments must have taken the highest literary degree. They are assisted by the Governor General or Governor of the Province and some ten to fourteen of district Magistrates who have won the title of Provincial or Metropolitan graduates. The examination is this time far more serious. It really is supposed to last but three days; practically however it continues through nine, as though the actual days of examination are the 9th, 12th and 15th of the 8th moon, the candidates have to enter the Examination Hall on the days preceding these dates and only leave it on the days following them.

The subjects for the three examinations are sent down from Peking by special Imperial Edict and are as follows :—

First Sitting: three formal disquisitions (*lun*) on subjects taken one from each of three of the Four Books and a poem of 8 rhyming couplets of five words to a line.

Second Sitting: five essays in the classic form (*wên chang*) upon subjects selected one from each of the following works, the Classics of Change, History and Poetry, the "Spring and Autumn Annals," and the "Book of Ceremonial."

Third Sitting: five dissertations on political questions suggested by the Dynastic Histories, the "Classics" and contemporary government.

The number of candidates, as in the case of the *hsiu ts'ai* or licentiates, varies considerably according to the literary

proclivities, the wealth and populousness of the province—on the average from 4000 to 10, 12 or even 15,000 at times at Nanking. The Metropolitan province of Chihli has the right to by far the largest number of degrees—267 including Bannermen—and the Candidates in it enjoy exceptional privileges, but this is counterbalanced to a certain extent by the disadvantages they labour under in the highest examination. In that their close proximity to Peking enables such a relatively much larger number to compete that it is more difficult for a member of Chihli to attain success than for one of almost any other province. Next to Chihli come Kiangnan with 114, and Kianghsi and Chêhkiang with 94 each. Kweichow and Kansu are the lowest with 40 each. As in the previous case each successful candidate is one out of a hundred and as all his competitors are picked men he is, or should be, in reality the best out of ten thousand. Here indeed is a distinction to be proud of! The list is published as before, but though the competitor's name appears in it, he is not yet sure of his position. By statute the second examination of successful candidates should be held by the Emperor in the Palace, but it was found that few could afford the expense of such a long journey, if they lived in the provinces. While therefore successful candidates from the metropolitan province are thus examined, those of other provinces are permitted to postpone their second examination until they proceed to the capital to compete for the honour of metropolitan graduate.

In this examination a special Imperial Commissioner is appointed to act on behalf of his Majesty.

The Examination consists in each case of an exposition of the meaning of some passage in the Four Books and a poem. In the examination for the degree of licentiate importance is attached to the candidate's penmanship and his essays are therefore submitted to the Examiner in original. In those for the ranks of provincial and metropolitan graduates this point is not considered, and to prevent any favouritism being shown if the Examiners

recognised the handwriting, all essays are recopied by special clerks and the copies only submitted. Both copies and originals of the successful essays are sent to the Board of Ceremonial at Peking, where they are compared together and their merits again scrutinised by an Imperial Commissioner in the Imperial Chancery. If wrong characters or other slight errors are discovered, the candidate, as a penalty, is debarred according to circumstances from competing at 1, 2 or 3 successive metropolitan examinations and the Examiner is reprimanded. But if any serious error of interpretation or style, or discrepancy between original and copy is discovered, the author is deprived of the title he has just won and the Examiner is severely punished.

At the second or final examination for this degree the graduates are graded by merit under four classes. Those in the first three are permitted to compete for the honour of metropolitan graduate, but those in the fourth are debarred from doing so for three, six or nine years according to the gravity of the errors committed.

Between the rank of licentiate and provincial graduate there are several grades to which the unsuccessful candidate for the latter can raise himself by examination and which enable him to enter by slow steps the governing body of the country. Without, however, waiting to examine in detail this complicated machinery, let us suppose the candidate has won the second degree.

On the 8th of the 3rd moon he is escorted by his friends to the gate of the Examination Hall and there enters upon the contest for the highest literary honours his country can confer, and which carry with them the possibility of attaining the highest official position in the State. The examination, which in the length of time it lasts and in the subjects proposed is the exact counterpart of that for the title of provincial graduate, is presided over by one Chief and 3 Deputy Examiners, all Presidents or Vice Presidents of some of the 6 Departments of State or of the Court of Censorate. They are aided by 18 Assistant

Examiners appointed from the three institutions from which the Chief Examiners in the provincial examination are selected : while the Governor of the city has the control of order and all arrangements within the Hall. The number of candidates who present themselves is on an average about 10,000 ; that of the degrees is not absolutely fixed, but is determined on each occasion by the number of competitors from each province so many to each. Last year the number of competitors was slightly over 10,000, the number of degrees bestowed was 316, or about 3 per cent. The Emperor then fixes a day for the authors of the selected essays to repair to the palace, when he proposes to them some political subject for written discussion.

In this style is subordinated to penmanship. The competitors are graded according to merit into three classes, the first consisting of but three individuals, the *Chuang-yüan, Pang yen,* and *T'an 'hua.* The number of the other two is not fixed, depending upon the number of degrees bestowed. The first in the second class also receives a special designation, *Ch'uan lu,* but none below him. A third examination consisting of a formal essay, *lun,* a state paper and a poem, has still to be undergone and then the graduates are graded in a final series of three classes ; but the first four in the previous examination are never changed except for some exceptionally gross error. The first three are given the rank of compilers in the Imperial Academy, the remainder of the first grade that of Assistant Secretaries in the Imperial Chancery or of Junior Secretaries in the other departments ; while the third are also appointed Junior Secretaries or are sent to the provinces to fill the posts of district magistrates. Finally as all the posts occupied by the first grade in the Imperial Academy will have to be vacated to admit the *élite* at the following tripos three years hence, their merits are again tested at the expiration of that period and the position they secure in that class-list determines the status they are subsequently to hold in the civil service of the country.

"The long succession of contests culminates," says the

Rev. Dr. Martin in his series of essays entitled, 'Hanlin Papers,' "in the designation by the Emperor of some individual whom he regards as the *Chwang-yuen* or model scholar of the Empire,—the bright consummate flower of the season. This is not a common annual like the Senior Wranglership of Cambridge, nor the product of a private garden like the valedictory orator of American colleges. It blooms but once in three years, and the whole Empire yields but a single blossom—a blossom that is culled by the hand of Majesty and esteemed among the brightest ornaments of his dominion. Talk of academic honours such as are bestowed by Western nations, in comparison with those which this Oriental Empire heaps upon her scholar laureate! Provinces contend for the shining prize, and the town that gives the victor birth becomes noted for ever. Swift heralds bear the tidings of his triumph, and the hearts of the people leap at their approach. We have seen them enter a humble cottage, and amid the flaunting of banners and the blast of trumpets announce to its startled inmates that one of their relations had been crowned by the Emperor as the laureate of the year. And so high was the estimation in which the people held the success of their fellow townsman, that his wife was requested to visit the six gates of the city and to scatter before each a handful of rice, that the whole population might share in the good fortune of her household. A popular tale, *La Bleue et la Blanche*, translated from Chinese by M. Julien, represents a goddess as descending from heaven that she might give birth to the scholar laureate of the Empire."

It may, however, be mentioned that in some parts of the Empire, especially in the north, the same appreciation is not shown of the honour reflected upon the whole district when such splendid success is attained by one of its sons. On the contrary it is not infrequently regarded as an ill omen for the district, the whole of its "luck" (and in the power of luck the Chinese are firm believers) being thought to have been exhausted by the fortunate recipient of these high honours. Great as is the distinction of the *Chuang*

yüan there is one still greater, but almost beyond the limits of possibility of attainment: namely the *San yüan;* that is that the same individual has headed the lists of provincial graduates, (*chien yüan*) of the successful in the first (*huei yüan*) and in the final examinations (*chuang yüan*) of metropolitan graduates. This almost impossible honour has, however, once been won during the last two hundred and fifty years—in 1820 by Ch'ên Chi-Ch'ang, a native of Kuangsi.

The question naturally arises: what is the object of this complicated system and what utility does the State derive from it? The answer is in a few words: the selection of the ablest men within its dominions for the service of the State. The writings of philosophers and the state-papers preserved in the Dynastic Histories insist almost without interruption during the last 4000 years that the stability of the Empire can *only* be ensured by securing the services of its ablest and most upright subjects as its official servants. B.C. 1753 Tang Kia of the Shang dynasty was advised to "raise none to posts but such as have wisdom and talents." The Prime Minister of Wu Ting (B.C. 1324-1266) says to his sovereign "the repose or distraction of your Empire depends upon those whom you place in posts. Give not, therefore, the smallest employments away in complaisance to a subject, who you know is incapable to bear it; and never trust anything of importance to a bad man, however great his qualifications may be." Confucius says, "Good Government depends upon obtaining proper men . . . . Justice is what is right in the nature of things; its highest exercise is to honour men of virtue and talents." Mencius says, "When the virtuous occupy official stations and men of talents are in office, then, when the members of government have leisure, they will illustrate the laws, so that even an extensive country will fear and respect them." The Emperor Tai Tsung of the T'ang dynasty says, "The most essential character of good government is, not to raise any to posts but men of merit and virtue. A prince who acts thus reigns happily; but there is nothing more dangerous

and fatal for a State than a contrary conduct." And in another state paper he says "The first principle of a wise government is to honour virtue; earnestly to search for men of virtue and merit is the chief duty of a prince. These are maxims universally received in all ages." To nonour virtue and to make merit the one road to rank and power is the basis upon which the government of China is founded. Virtue, of course, is relative and its standard, like that of all moral qualities, varies with circumstances and the sentiments of the age. What is virtue here is not so esteemed there, and what was high moral sensitiveness a century ago is looked upon as moral degradation to-day. Corruption, it cannot be denied, exists to a deplorable extent in China, but let not the West be too ready to cast a stone. How long ago did it cease to exist in the West? Has it indeed ceased to exist? As regards ability there can be no question of the success of the system already sketched out. The officials in China are not only the flower of her scholarship, but the ablest of her subjects. And the importance of this fact can scarcely be exaggerated. By securing for the government the services of the wise and talented, the efficient performance of public business is most likely under any circumstances to be ensured, but especially is this the case where, as in China, the legislative, judicial and executive functions are not exercised by separate classes but are practically merged in one body. But there are other results which are no less beneficial to the welfare of the State, though they are rather, perhaps, the accidental outcome of the system than the effects of forethought and deliberate intention.

1°. It opens a road free to all along which everyone, no matter what his birth, knows he can, solely by his own personal exertions, raise himself to *certain* high social distinction, *perhaps* even to the highest official stations in the kingdom. It thus tends to promote a high sense of self-respect and self-reliance and to stimulate a healthy emulation throughout the nation. To show how strong is this feeling it is but necessary

to point to the perseverance with which in spite of repeated failures and increasing age the coveted literary honours are pursued. Last year from ten out of the 18 provinces no less than 102 candidates over 80 years of age, and 23 over 90 years of age, were brought to the notice of the throne that the customary honours might be conferred on them after their third unsuccessful attempt to secure the grade of provincial graduate. Thus, too, the energy of those ambitious spirits which, were there no such road open before them, might foment disturbances or excite revolutions, is changed into a powerful support for the State.

2°. It gives all an interest in the state and inspires them with an attachment for the country and its institutions. Every family has some one of its members holding an official capacity ; and the other members look forward to gaining a similar or perhaps higher position. The class distinction, also, between officials and merchants in China is so great that it can only be bridged over by the acquisition of literary honours. The fact that the hopes and aspirations of all classes are directed into the same channel and towards the same goal, exercises an influence upon social life which is felt at every turn. Literary honours are the most common topic of conversation, and trials of literary skill the most common form of amusement among the educated. When strangers are introduced etiquette requires that the honours they have respectively taken, the year, the class, &c., shall form almost the first topic of conversation. Young men have their clubs in which a member of the Imperial Academy propounds once or twice a month the subject of an essay or poem, classes the competitors according to their merits, points out their deficiencies of style and idiom, and finally decides what essays are at the end of the year worthy of private publication, or which

is entitled to a prize of paper and ink ; while trials of skill in capping verses are among one of the commonest forms of after-dinner amusement. Thus "teacher" has come to be one of the highest titles of respect, and the relations between teacher and pupil, and between the pupils themselves grow so binding that in the time of difficulty they are seldom appealed to in vain. Even the fact that two men have won success in the same examination is a tie which binds them one to the other. Thus the educated body, i.e. the officials *in esse* or *in posse* are so bound together as to form a veritable *imperium in imperio*, which it would be dangerous for the monarch to disregard or treat lightly.

3°. It tends to ensure the stability of the Government. The educated classes are necessarily strongly Conservative in their views and interest prompts them to sustain the existing Government, for they know that were a revolution to take place power, at least at the outset, would not continue in their hands but must fall to the military supporters of the new *régime*. The Government on the other hand has every reason to rely upon the educated classes. For starting from the maxim that the best laws can only be enforced by the wise and talented, it must be the ruler's chief policy to raise this class far above all others. And a study of Chinese history shows that this has been the distinguishing feature of Government under every dynasty during the most flourishing period of its sway and that the revolutions which have occurred have almost invariably had their origin in a departure from this principle.

Thus in its educational system we find the explanation of the three most striking features of the History of China.

1°. the conservatism of its government.

2°. the anomaly of a sovereign regarded with the reverence due to a deity working through institutions

which render the government the most truly democratic in the world, and

3°. an uninterrupted national existence extending over a period unparalleled in the world's history—4000 years—during which the country has been continually enlarging its borders and increasing its power and influence.

Finally—It has been seen that the system in China is not one of State-endowed, or State-aided education, but of leaving education to private enterprise and public charity, the State offering the highest possible inducements for the encouragement of study, fulfilling the functions of a University by the bestowal of degrees and culling the choicest fruits for its own use.

Might not England profit by the experience of China and instead of endeavouring to introduce compulsory education, adopt in a modified form the system which has produced such grand results in the Far East? It appears impossible to make education compulsory and at the same time to force the recipient to pay for what he often has to take against his will. To be logical, education if compulsory must be free. And to take the money of one class to educate another is a principle which opens up political issues of a most serious nature. Instead then of introducing a system which if carried to its logical conclusion, as in the end it would be, would revolutionise the principles of British government, would it not be better for the State to leave the money in the pockets of the people, and itself offer, as the reward of literary and scientific eminence, such honours, social distinction and rank that all would *proprio motu* and at their own expense press forward to secure them? Thus dangerous precedents would be avoided, and for a compulsory and therefore irksome system would be substituted one that was voluntary and therefore congenial in its character.

DIET, DRESS, AND DWELLINGS

OF THE

CHINESE IN RELATION TO HEALTH.

BY

JOHN DUDGEON, M.D., PEKING.

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DIET, DRESS, AND DWELLINGS

OF THE

CHINESE.

Introductory Remarks.

In the following paper our remarks apply particularly to Peking and the North of China generally, but much that is said will be found to be true of China as a whole. Facts when not otherwise stated must be understood to refer to Peking.

Writing for English readers, we shall barely if at all touch upon the defects of the Chinese in respect of the subjects now to be discussed, except in so far as we can enforce the lesson more strongly and compel attention to the importance of the condition desiderated. That there are failings in the Chinese system no one will deny. It is by a comparison of the respective advantages possessed by the East and West that mutual benefit is to be derived. Were we writing for the Chinese it would doubtless be our duty to suggest improvements of various kinds borrowed from our practice in the West or deducible from chemical, physiological and sanitary principles, little if at all understood, or at least acted upon, in the East. Every one, however, conversant with the country and its conditions, will admit that the Chinese, notwithstanding their ignorance of our science, have admirably suited themselves to their surroundings, and enjoy a maximum of comfort and health and immunity from disease which we should hardly

have supposed possible. This ancient Oriental people have a good many lessons yet to teach us in respect of living and practical health, as well as others bad and dangerous from which to warn us ; and her experience of thousands of years, handed down unimpaired and followed out with a devotion and undeviating regard to " old custom," cannot but be of value to the West. That she has existed and flourished to the present day when all other countries of the ancient world have long ceased to exist, is a fact no less true than strange, and probably some of the reasons of this persistent vitality and antagonism to decay are to be found in some of the matters which it is now proposed to discuss, and which certainly stand closely related to the weal of the individual and the nation. And in these days of an advanced and unnatural civilization, where life and all its surroundings are so complex and artificial, it may not be amiss to take a review of a bygone yet existing civilization where life is more natural and simple. On account, therefore, of the great antiquity and vitality of the Chinese, the extent and denseness of the population, and the great range of climate of their vast territory, the subject is specially interesting and instructive. Whatever the cause or causes may be, whether that they eat simpler food more regularly and at more seasonable times, or that they dress themselves more comfortably and suitably to the climate, or that they drink less stimulating potions, live in houses free from the exigencies of modern Western so-called sanitary science, keep better hours, marry earlier, take more care of themselves in health and disease, live a life of more repose both physical, intellectual, and spiritual, have their passions more subdued, and their whole life and its actions more under the control of reason and the maxims of their sages—from one or more or all of these we do not venture to say, but this we can aver, after an extended experience of over twenty years' practice and life among them, that the Chinese, and this is equally true of Asiatics generally, are subject to fewer diseases, that their diseases are more amenable to treatment, and that they possess a greater freedom from

acute and inflammatory affections of all kinds, if indeed these can be said at all to exist.*

Climate has largely operated in determining the nature of Chinese food and the form and style of their clothing and houses. From the great extent of the Chinese Empire, great variations of temperature, from semi-arctic cold to tropical heat, are experienced. Such climatic changes are felt, though to a less extent, within the limits of China Proper, or the Eighteen Provinces. On account of its position on the eastern quarter of a great land continent and its prevailing winds, the seasons in China are much colder in winter and warmer in summer than the latitude of the country (20° to 42°) would lead us to infer. The country in these respects would compare with the Atlantic States of the American Union. These two extremes of temperature have necessitated the architecture of their houses and the clothing and nourishment of their bodies; ventilation, coolness, and lightness being aimed at during the hot season; comfort and warmth during the cold season. These climatic vicissitudes afford the key-note to the style of clothing adopted from the earliest ages to the present time, where the same general principles have always ruled, and where imperious and fickle fashion can hardly be said to exist. The same causes will be found to operate in determining the diet and dwellings of the people. How far the Chinese have succeeded in the prevention and cure of disease, in the maintenance of a high standard of health, in short in maintaining the *mens sana in corpore sano*, which in theory and practice is the aim of all dieting, dressing, and housing of the people, the freedom from disease, and the longevity and vitality of the people abundantly illustrate.

* See the writer's 'The Diseases of China: their Causes, Conditions, and Prevalence, contrasted with those of Europe,' p. 64. Glasgow: Dunn & Wright, 1877. Also Chinese Customs Medical Reports; 'On the Physical Conditions of Peking, and the Habits of the Pekingese as bearing upon Health.'

THE DIET OF THE CHINESE.

THE separate articles composing the food of the Chinese, in the order as far as possible of their importance, will first be reviewed, and such remarks and reflections made and inferences drawn as appear to be warranted by the subject; and with the view of making it as practical and interesting as possible, Western modes of living will be compared with the Chinese. In conclusion, a brief summary of the salient points of the Chinese diet will be given, which it is hoped may furnish suggestions for an improved Western dietary. The cereals fall necessarily to be considered first. In the preparation of this article I have to acknowledge my obligations to the excellent manual on 'Food,' by A. H. Church, M.A., one of the Science Handbooks of the South Kensington Museum.

"Wenn man eine Armee bauen will, so muss man mit dem Bauche anfangen; denn diese ist das Fundament davon."—*Frederick the Great.*

"Allow not nature more than nature needs,
Man's life is cheap as beasts'."
—*King Lear.*

CEREALS.

In China, as indeed in all countries, the cereals, rice, wheat, millets, maize, and such like, form the mainstay of the people. A common question asked by the Chinese of foreigners is as to the existence of grain in foreign countries and if the soil be cultivated, the underlying idea being that "barbarians," not having attained the civilisation, do not possess the ordinary means of maintenance, of the inhabitants of the Middle Kingdom.

Rice is the principal article of food among the Southern Chinese. In the north, wheat and the millets compete with

it as the chief staple of food. One and a half pounds daily is the allowance for an able-bodied man, boiled and mixed with salted vegetables or preserves to give it a flavour. Requiring as it does a high temperature and abundance of water, rice is extensively grown in the centre and south of China. It is planted in low-lying lands which are covered with water either artificially or naturally. It is the most largely consumed of all the grasses, forming the main food of about one-third of the human race. The great rice-growing and eating countries are, of course, China and India. It is not, I believe, allowed to be exported from China. Being deficient in flesh-forming and mineral matters, it is, therefore, alone not a perfect food. It is used by the Chinese along with various kinds of peas and beans in the north and fish in the south, substances rich in flesh-forming material. It is here very remarkable and worthy of particular notice that the Chinese, as indeed more or less all mankind, should have hit upon a combination of food giving a due proportion of heat-givers as in starchy food, to be consumed along with flesh-formers, as in fish and seeds of leguminous plants which have a highly nitrogenous character. As this combination of rice and fish holds good in the south, so in like manner with the cereals and pulse in the north, where the combination is precisely identical. From these circumstances valuable suggestions are to be derived by which we might recast our dietary with profit both to our bodies and purses. The Chinese have succeeded intuitively, or as the result of their long experience, in the attainment of the maximum of nourishment with the minimum of cost, which ought to be the object of every people and not alone of a Government dietary for soldiers and sailors. It is first boiled and then steamed dry so that each particle stands apart from its fellow. There is a great art in boiling rice which the Chinese alone seem to possess. We may be able to cook it for a pudding (and hardly even then), but never as a vegetable. It is prepared dry, when the rice water is either thrown away, used as a drink, or given in food to pigs, or it is prepared

wet as a kind of porridge, the congè being retained. This latter would seem to be the preferable mode of cooking it (although in health not the most common in China), for it yields to boiling water a considerable portion of its nitrogenous and mineral constituents in which it is already deficient. Much starch is made from it. A kind of food for infants called *kau kan* (the only infant's food in use in China, for unless in exceptional circumstances, such as the death of the mother, absence of milk and inability to secure a wet nurse, the Chinese always suckle their children long, rarely less than three years, frequently much longer) is prepared from rice, which is smeared over the child's gums. Rice when growing is called *tao tse* or paddy, when in husk it is called *mi*, when boiled it is called *fan*, which is the word in China used generically for food, thereby indicating the high position rice occupies in the dietary of the people.

Wheat (*mai tse*) is largely cultivated in North China. It is sown in the autumn and reaped in May or beginning of June. On account usually of the dearth of snow in winter and the absence of rain in the early spring, the wheat crop is very precarious, often a failure in many places (especially on high or sloping lands), or deficient in both grain and straw. The broken straw is used for mixing with mud for roofing their houses and is then called *hwa chiau*. The composition of wheat grain appears to be more constant than in Europe. The seasons being dry, the starch is increased and the albumenoids diminished. The reverse, we know, would be the case in wet seasons. The flour is by no means so white as the English, American, or Russian specimens. Wheat is considered in the north the most valuable crop. It brings a better price and requires no weeding. Every person who can afford it tries to alternate it daily with rice or millet in the two meals which are usually taken. The meal of flour is the more expensive, but the more satisfying and gives more stamina, and its supporting power lasts longer. In sickness the rice is had recourse to, the congè of rice being particularly easy of digestion and at the same time nourishing, and forms a suit-

able drink. In infantile troubles of the stomach and bowels, nothing surpasses rice water as a food. This is retained when all else is returned. In all other circumstances wheaten flour is preferred to the rice. In winter when snow falls it is metaphorically called "white flour" at Peking, indicating that the wheat crop will thereby be secured, and in consequence the extreme value of the snowfall. The people prefer the whitest and finest, the bran being used exclusively and largely for fodder to beasts of burden, mixed with chopped sweet millet straw, and the coarse brown or black flour, as it is called, is made into large cheap cakes and sold to the lower classes and beggars. Maize is often added to the wheaten flour to cheapen it. This renders it less glutinous. But as price and not quality rules everything in China, and as the price of wheat must bear a certain relation to the best qualities of rice, the adulteration is not noticed. No earthy adulterants are added so far as I know. The constituents of wheat are so proportioned as regards its flesh-forming and heat and force producing characters, that it is found to be peculiarly well fitted for the general sustenance of man, and hence, *par excellence*, deserves the epithet "staff of life." The process of grinding in China is by means of two stones roughly scored and placed one upon the other and set and kept in motion by mules, asses, or women. The "two women grinding at the mill" may be seen anywhere in North China. There is no such elaborate milling as in the West. The flour is passed through the finest sieve, and the grinding is carried on until this is effected. Three sorts are turned out, the fine, the black, and bran. The flour is made into vermicelli and bread which is invariably steamed, not baked. It is also made into cakes of various sorts with sugar, oil, or soy. The bread is always leavened. In seasons of famine it has been mixed with chaff, elm bark meal and other matters. In China no such question as the extending of the cultivation of wheat and legumes, of oil-producing plants and of fruit trees, comes up as in India.

Oats (*yeu mai*) are not grown in China except to a small

extent close to the Great Wall, and are used chiefly in feeding camels. As a food it is not eaten by the people in that region except in cases of great poverty and bad wheat and millet seasons. It is from this region that foreigners in the north of China draw their supplies of oats and potatoes, and the latter especially seem to be grown to meet the foreign demand.

It is not so, however, with *Maize*, which is largely grown in the north and consumed by the common people. It is made into cakes, roasted and steamed. In season the heads of the Indian corn are boiled and sold on the streets. This cereal is very satisfying. It is poorer than wheat in flesh-formers, but richer than rice. It contains more fat than wheat, barley, or rice. In China there are no preparations of maize corresponding to corn flour and the many other popular preparations of this grain, which are all more or less pure starch. In the ear it is called *ü mi*, jade rice, or *pang tse;* its flour is called *pang tse mien.*

The *Millets* form a group of food products which are largely grown and consumed. Vast numbers in the country live entirely on this food. There are several varieties. The tall millet is called *kau liang* (Barbadoes millet, *Sorghum vulgare*), of which there are several varieties distinguished by their colour, red, black, and white. This millet is largely used for feeding horses in conjunction with black beans, which are steamed as much to increase their bulk to the seller as to render them digestible by the animals. A coarse spirit is also distilled from this millet as well as from the millet next mentioned, and the exhausted seeds are used for feeding cows. The most commonly used millet is called in the husk *ku tse*, and when hulled *siao mi* (small millet, *Setaria Italica*). It is made into a porridge and cakes. The straw of the *ku tse* is used in North China as fodder for animals. As far as the composition of this millet is concerned, it is quite equal to wheaten flour. Another kind called *hwang mi* when hulled, and *shu tse* in husk (*Panicum*), is extremely glutinous, and is also very largely consumed and very pleasant in porridge. On the

streets are wheelbarrows for the sale of this glutinous millet made into huge cakes with jujubes. A similar preparation, also containing the fruits of the Zizyphus, is made with a kind of glutinous rice and wrapped up in triangular shapes covered with the leaves of the Indian corn and eaten on the point of a chopstick.

Buckwheat (*chiau mai*) is not much cultivated in North China, but being of quick growth (forty days) and easy cultivation, it is frequently sown late in the season, when other crops have failed for want of the early rains or after the ground has been cleared of the gourd group, and is not wanted for pulse.

Barley (*ta mai*) is also not largely grown, and is chiefly used in the feeding of animals. Rye is not grown.

Pulse.

The seeds of leguminous plants are richer in flesh-formers than the grain of the cereals. The ratio of pulse (peas, beans, &c.) flesh-formers to heat-givers is as 1 to $2\frac{1}{2}$ instead of 1 to 5, as in wheat, or 1 to 10, as in rice. This consideration suggests that pulse should be eaten with other foods rich in starch, sugar, fat, oil, or non-nitrogenous nutrients, as, for example, beans and rice, or beans and bacon, both of which combinations, especially the former, obtain in China, thus illustrating the principle of the cheap and nutritious combination of food already remarked upon in relation to rice and fish. Beans and peas should always be eaten, as in China, with starchy foods like rice, or with bacon. The vegetable casein, the albuminoid principle of pulse, resembles the animal casein of milk. In China, this albuminoid principle in peas and beans is made into cheese in the form of the so-called bean-curd. Bean-curd at Peking is made in the following manner. Beans, especially the *Hwang tow* (*Soja hispida*, Soja bean) (other beans can also be used for this purpose, e.g. *Phaseolus* and various sorts of *Dolichos*), are allowed to soften in water twenty-four hours, until they swell greatly. They are then ground in a house-mill, and water in abundance is poured upon them.

Then this mixture of bean-meal and water is boiled and filtered through linen, and when it is cold, gypsum is added to it, whereby the casein is precipitated. This casein is bean-curd. The manufacture is to be found everywhere all over China. This bean-curd takes the place in China, of milk, cheese, and butter in Europe. It is largely used by the Chinese when vegetables are not very plentiful. This substance enters into the composition of many articles of food. Every variety of bean is used as food. The *hwang* (yellow) *tow*, is used chiefly in the manufacture of bean cake at Newchwang in Manchuria. The oil is expressed, and the residue made into cake, which is extensively used as a manure in the sugar plantations of the Southern Provinces. Western chemistry might with profit devise a cheaper and quite as effective a manure for the sugar-cane, and thus set free an enormous bulk of pulse for human food, or land for the production of the cereals. Vermicelli is often made from beans as well as wheaten flour. Beans are boiled as an article of food, either when freshly gathered or dried. The yellow bean is principally used for the making of oil (in which it is rich) and bean-cake, and also for food, and in the manufacture of bean-curd, &c. In some places it is mixed with vinegar and sesamum oil and drunk as a cooling draught in summer. Green beans (*lii tow*, *Phaseolus angulatus*) are used for food, and, it is said, also manufactured into cakes, and used largely in the south for manuring purposes. The oil is used for cooking and illuminating purposes. Various other sorts of beans are also used for food, and constitute most valuable nutritious articles of diet. They are largely eaten, unripe and green, as a vegetable with rice and millet (in the unripe condition the albuminoid matter contained in them is more easily digested); and ripe, in the form of dried peas, boiled along with the rice. They are also eaten salted, and in oil. Bean-sprouts, the germinated bean of the plant, are artificially raised for food in winter. These beans are also boiled with flour, allowed to ferment, mixed with salt and reboiled, and

after a time sun-dried, pressed and strained, and constitute the well-known soy which has become the basis of all, or nearly all, of the meat sauces and condiments of the world. Soy is the name in Japanese of the bean from which it was originally made. Soy is believed by the Chinese to excite appetite and to correct any injurious qualities of food. In fact, beans, bean-curd, and bean sauce or soy, are considered to be antidotes to all poisons, and are so used by the people, and recommended in their pharmacopœia. In every Buddhist temple are to be seen huge *kangs* (water cisterns) full of this soy. Spread between layers of wheaten cakes and otherwise placed in food a rich and appetising relish is obtained. Pease-pudding and pea-soup are not found in China. In fact, except at dinners of ceremony soups do not form a portion of their diet. The Mohammedan butchers in the north prepare a flavoured mutton soup or sauce, which is frequently used as a substitute for soy. To render beans more tender, and therefore more easily digested, and perhaps to shorten the period of boiling, they are often allowed to germinate for a few days before being cooked.

Ground or *pea nuts* (pods of *Arachis hypogæa*) are largely produced in many parts of China, in many cases in sandy waste soils where aught else would be grown with difficulty. The flowers curl down and force the immature pod into the soil, where it is curiously ripened ; hence the Greek term *hypogæa* and the similar term *lo hwa sheng* (falling flowers growing) used to indicate this growing below the soil. They are dug out of the ground, the sandy porous soil being thrown against a sieve. The nuts are not so large as those of America. They are roasted and hawked about the streets day and night by poor agriculturists from the country. They have a very pleasant taste, and are remarkably oily (52 p.c.), and contain about the same amount of nitrogenous matter (24·5 p.c.) which usually occurs in peas and beans. To be nutritious they require an admixture of starchy food. They are eaten as an adjunct to food and as a pastime throughout China. The oil is used for cooking and lighting, and the refuse is used extensively as manure.

The *sesame* seeds (*Sesámum indicum*, containing 51 p.c. of oil) are still more largely used in China than the ground nut. They are extensively used, strewn on the surface of cakes and biscuits to give them a relish. They are also mixed with sugar and flour and made into confectionery. A thin cake resembling oat-cake is made with wheaten flour and sesamum seeds. The oil of the seeds is used for cooking, and the refuse is pressed into cakes and used as a manure. An extract of the seeds is used as an opium adulterant. The purified sesame oil is very largely used, and takes the place of butter, lard, and suet for all culinary purposes. This oil in China takes the place of olive or salad oil in the West. Indeed, large quantities of the ground and sesame seeds are exported from Pondicherry to Marseilles and other ports in Europe for the purpose of being manufactured into, or for the adulteration of, olive oil. Many other nuts or seeds of fruits are used, mainly for the oil which they contain, among which are almonds, peaches, chestnuts walnuts, melon, hazel (*Corylus sp.*), lotus nuts, pine seeds, &c. Water-melon seeds (*Cetrullus sp.*) are gathered when ripe and stored away until they burst or are easily broken open. The seeds are then washed from the pulp, dried in the sun and slightly fried and then sold for use. To munch these seeds while sitting and chatting, before and during dinner and in the theatres and restaurants, is a well-known fashion in China, and certainly to be preferred to the ardent potions sometimes had recourse to in the West.

The peculiar notching of the central upper permanent incisors, attributed to a hereditary syphilitic taint, is ascribed by the Chinese to the eating of melon seeds, which require a peculiar biting operation between two of the front incisors to split the outer shell! (It is also attributed to the use of the jade mouthpiece of the tobacco-pipe!) Almonds, the kernels of the apricot, are made into tea, or rather soup, and sold everywhere in the towns in the morning. It is frequently taken after dinner. Peach and apricot kernels are largely used in confectionery and fine cakes. Lotus seeds (*Nelumbium speciosum*) are also largely eaten and are often boiled in soups.

In regard to oil and fats (for the distinction is one mainly referring to their condition of liquidity or solidity), the Chinese, therefore, although they consume no butter, cheese or cows' milk, and comparatively few eggs, are yet an oil consuming people. Oils or fats form a very distinct and important section of the group of heat-givers. They form no muscular tissue, but maintain the heat and activity of the body $2\frac{1}{2}$ times that of the starchy nutrients. In the process of digestion an *emulsion* is formed by the pancreatic juice, after which the finely divided globules of oil are absorbed by the *villi* which line the small intestines. The chestnut (*li tse*) (*Castanea vesca*) roasted is sold on the streets of Chinese towns as in many in Europe. The Chinese plan is to put them into a large cauldron with small gravel or chips of hard stone, into which some black sugar or treacle has been put, and then the fire being applied, they are kept in constant movement by means of a large shovel. In this way they get quickly and thoroughly roasted without the danger of being burnt in one part and underdone in another, or of adhering to one another. A large number can thus be roasted economically at once. They are so rich in starch and contain so little oil that they should properly be included among the bread-stuffs. The walnut is also largely eaten. It contains little or no starch, but much nitrogenous or albuminoid matter, together with about 50 p.c. of oil. They are generally eaten sugared, From the cocoa-nut husk, mats, cordage, and brushes are made, and from the nut itself drinking cups, ladles, &c.

Animal Foods.

Many of the nutrients found in animal foods are identical, or nearly so, with those found in vegetable products. Animal food forms an insignificant part of the Chinese dietary. In China Proper there is little or no pasturage. The country is densely peopled, and the land divided into small plots. Each family owns its own patch of land. The very utmost is extracted from the soil. The people

derive from it the barest subsistence. No land is allowed to lie fallow. Beyond pigs and poultry, no domestic animals serviceable for food are kept. Except in the extreme north, bordering on Mongolia, sheep are unknown. The ox of the north and water buffalo of the south are the horses of China. They perform all the work of ploughing, &c., and going to market. They are too sacred to be killed and eaten. They are offered in sacrifice only by the Emperor of China—the Son of Heaven—to the Supreme Ruler. The pig is the poor man's friend in China as in Ireland. Pork can be obtained almost anywhere throughout the country and at all seasons. The native Chinese are pork-sellers, the Mohammedans are the mutton-sellers. In the north, beef, mutton, and pork in the large cities are partaken of, alternating perhaps with a sirloin of camel, horse, mule or donkey, for these animals, when they sustain a fracture or severe accident, or are incapacitated for further work by reason of age, supply cheap meat to the poorer classes. The mutton is of first-rate quality. The beef is inferior to that of England, but would compare favourably with that of the continent. The extensive prevalence of the Buddhist faith has had an influence inimical to the consumption of butchers' meat. Strict religionists of this sect ought not to eat meat wherein life has existed. Such at least is the theory—in their practice they break every precept of the gospel of Shakyamuni. In China, where a vegetable diet rules so largely, the presence of intestinal worms might naturally be inferred. The most common parasite in the world—a great vegetable feeder—is introduced into the system by carelessly washed vegetables and salads. The trichinæ introduced into the body, as for example the ova or larvæ of the tænia or tape-worm by underdone or raw pork, ham or sausages, are also by no means rare. The only safety against these parasites consists in the thorough cooking of meats and washing of vegetables, in which the Chinese are not so particular as they are in regard to drinking only boiled water. Trichinæ cannot live after being subjected to a heat of 122° F. and

the heating of ordinary cooking is far above this temperature. On account of the prevalence of round worms in Chinese children the treatment of their affections should invariably be preceded by some anthelmintic like the efficacious santonine. Worms are said to be more frequent among total abstainers, the effect of alcohol being supposed most unfavourable to their existence in the intestinal canal. Among adults the tape-worm is very common, but readily gives place to repeated doses of male fern extract. They are very apt, however, to recur again and again. Speaking of worms, it is perhaps here worthy of remark, that the Chinese believe teeth decay through the presence of worms, and that consumption arises from a similar cause. It is very odd to find this people holding firmly to the belief in worms and germs (bacteria and bacilli in modern phraseology) which are only now becoming recognised in the West. The belief in dental worms is wonderful, when we think that exactly two hundred years ago, a Dutchman made the discovery, by the aid of a microscope, of worms in the white substance adhering to his teeth. But to return. The pork is for the most part eaten fresh. The swine are invariably black, a white or speckled one being even rarer than a white crow. At the ports where cross breeding with foreign pigs has taken place, this remark of course does not apply.

It seems incredible to speak of a country without milk and dairy produce. It is remarkable that a third of the race should after weaning never again take to that food which is the natural nourishment of the young of all mammalia, not at least until they reach their second childhood, when, if their means permit, they hire a wet nurse or purchase the milk of women, to be had in many Chinese towns. In the city of Ningpo, for example, I have heard of women's milk for sale in the streets, and lately at Peking, when the Empress Regent was seriously ill (presumably at that period of life when the catamenia cease), and doctors were ordered up from all the provinces, a wet nurse was retained in the palace for her benefit. The milk of childhood is supposed

to have peculiar strengthening, sustaining, and restorative properties. Cows' milk is not drunk, for much the same reason that its flesh is not eaten, one of the additional reasons adduced being its supposed phlogistic or heating character. In Peking alone, perhaps of all the great cities of Northern China, are cows to be seen, tied along with their calves, on the streets in large numbers. Veal cannot be had, as the young animals are considered necessary during the year in which the dams give milk, to enable the milker to deceive the cow, and so extract the lacteal secretion in larger quantity for the preparation of the article mentioned below. Indeed, when a calf dies, the mother is killed, no attempt being made to milk the cow afterwards. Whatever may be said to the contrary as regards foreign cows, the Chinese believe the practice to be necessary with regard to the Mongol breed, which is the only breed used in North China. It is said of the mother yak in Thibet that she is so fond of her young that when it is taken from her she will not give any more milk. A calf once died, and the cow (on hire in the family of the writer) was to be taken away to be sold. I undertook the responsibility of continuing to milk her as usual. A wet cloth was used to swab the teats to deceive the cow, with the fortunate result that as much, if not more, milk than previously was obtained ; but shortly afterwards, having occasion to remove from the country into Peking, the cow was changed, and the calfless cow killed. Proximity to Mongolia, the comparative cheapness of cows there, the rarity of and consequent demand for beef by foreigners in the capital, may render it less necessary to be careful about cows. The market is regularly supplied with new cows in the beginning of winter in view of the demand for *lau* in the following summer. The Thibetans are wiser with regard to their yaks than the Chinese with their Mongol cows. Could not the Chinese follow the example of the Thibetans, their tributary people, who lay a foot of the young yak before the mother, and while she licks it her thoughts are taken up, and she is content and gives her

milk as usual? The Mongol cow is never kept over two seasons, the pasturage during the second winter, and their liability to disease and death when fed on the hills near the city, rendering it more expensive and troublesome than buying new cows. That the presence of the calf enables more milk to be obtained is a fact, however, which cannot be disputed. When the cow is milked dry, one or two applications of the calf secures an additional supply; and, moreover, the presence of the calf finally secures a thorough emptying of the udder, which is essential to a prolonged secretion, and the keeping up of the quantity. Whether other means in the absence of the calf would be available to ensure an increased secretion, or at least an augmented milking, is a question that has not been considered by the Chinese. At Peking bullocks and cows, on account, I presume, of their semi-sacred character, are not allowed to be slaughtered in the city, but at T'ungchow, 40 *li* distant. Pigs and sheep, however, are killed on the streets. The Mahommedan butcher who kills the latter repeats an Arabic prayer while performing the operation, apparently to remove the sin attaching to the act.

If milk were held in esteem, or considered a prime necessity of life, even the Chinese might find ways and means of meeting the want. At Aden, where not a blade of grass is to be seen, and all fodder must be brought inland, every family possesses one or more goats. There is ample grazing ground in China along the edges of the corn patches and road-sides and around the grave tumuli to feed such animals. How much more so might goats be made a source of health and profit in Britain, ample grazing ground being found on the heaths, hedgerows, and road-sides. The cows are milked morning and evening, and about five or six quarts on an average are obtained daily from each good cow, particularly in the early infancy of the calf. The cows are fed exclusively on the millet refuse of the distilleries and manufactories of vinegar. Brewers' grains increase the yield of milk, but in England it is said such milk does not keep so well nor

carry so much water. At Peking the unadulterated milk is excellent in quality, and from it good butter is produced in foreign hands. The milk is boiled, and a little sugar and spirit added, and a soft curd is formed called *lau*, which is iced and sold. The Manchus and retainers in the palace are its chief purchasers. It is a very cool, pleasant, and nourishing dish in summer. It may be wondered how the youth of China subsist without an article which in other countries is deemed so essential, and which may be looked upon as a model food—"Nature's own food"—and as furnishing all the nutrients required by the growing immature animal, and these in due proportion. We have elsewhere in this paper pointed out more particularly how this defect is supplied by the bean-curd. The question of milk in regard to its adulteration, power, and readiness of absorbing diseased germs, and so being the medium of spreading disease such as is so often asserted, and apparently with good grounds, in Europe, does not interest us in China. This is a point of very considerable importance.

The cows are brought down each year from the grass lands of Mongolia in the autumn. After the fresh pasturage of the plateau, it takes them a few days to get accustomed to the exhausted grains of the brewer. Occasionally a handful of crushed black beans and cut straw is mixed with their food. The milk seems to be of fair quantity and quality, and excellent butter, in foreign hands, has been made from it. Human milk having fewer solids, milk-fat, and casein than cows' milk, to make the latter resemble the former, to each pint must be added about ten ounces of warm water and one-and-a-half ounces of sugar. But even in this form, and with this explanation, we do not succeed in overcoming the Chinese prejudice against animal milk. It is not so, however, among the Mongols inhabiting that vast territory north of the Great Wall. The Mongol revels in mutton, milk, butter, and cheese, which form almost his sole food. He barters his sheep-skins at a ruinously low rate for the Chinaman's mess of pottage of millet. Living as he does, the Mongol

type is of course altogether different from the Chinese. Whether this is original, or induced by the free and active life passed so much on horse- and camel-back, and generally the nomadic and pastoral habits of the people, or the animal nature of their diet, we leave to others to decide. Each and all of these factors may be potent. In type and liability to inflammatory affections, he is like his brethren the Mohammedans of Central Asia, many of whom are now settled in China, and who likewise live largely on mutton.

Koumiss, or fermented mares' milk, is unknown in China Proper, although well known in parts of Mongolia and among the Tartar tribes of Central Asia generally. The milk of the mare is allowed to ferment; alcohol and carbonic acid are formed from some of the sugar; the casein separates at the same time in curds. It is quite wholesome and nutritious. The casein in the milk of equine animals is in the same form as the casein in human milk, and different from that of the milk of the ruminants, in being but imperfectly, if at all, coagulated by acids. It is used in Russia in phthisis, and has been recommended to the medical profession in Europe, where in some parts this cure is carried out.

Butter.—As there is no milk, so there is no butter in China. It is known in the north by the name of "yellow oil." The Mongols have a butter which no amount of washing can deprive of its unpleasant taste and render it fit for the table. It is equally unserviceable in the kitchen. This disagreeable taint and peculiar taste must be owing either to the mixture of various milks of different animals, or to the want of precautions to avoid the access of all those odorous vapours and volatile flavours which are so characteristic of the unwashed body, fur clothes, felt tents and argol heating fuel of the Mongols. Nothing is so absorptive of these flavours as butter.

Cheese (*nai ping*) is found in Mongolia in small cakes, stamped with some felicitous Chinese character. These cheese cakes are very sour, and are eaten only by the Mongol priests (lamas) and natives of Mongolia living in

the capital. There is a form of soft cheese made into cakes like Scotch oat-cakes, which comes from Mongolia, is sold in the Peking Mongol market, and is extremely agreeable. It is very reticulated and sweetish. It is made by boiling the milk and skimming off the froth, and is spread out in successive layers until thin cakes are formed, which are allowed to dry and harden sufficient for being transported. Nowhere else have I seen or tasted this "milk skin," as it is called. It is worthy, along with the *lau*, of being introduced into our British dietary.

In bringing these desultory notes on milk to a close, it may be interesting to remark, as exhibiting the culinary skill of the Chinese, and the many pleasant forms in which milk can be presented, that I was once invited to a large dinner of ceremony by some of the highest officials in Peking, and knowing the foreigner's predilection for, and constant use of, milk, the sumptuous dinner was composed almost entirely of articles of milk composition, and neither cheese, butter, *lau*, nor *nai p'i* (milk skin) formed a part.

Eggs (*chi tse*) are largely consumed in China. The poor people rear poultry somewhat extensively. Eggs, when laid, and the young fowls require to be most carefully guarded against the destructive inroads of crows and weasels. They are taken raw, or boiled, or poached, or more frequently made into omelettes with vegetables. Every puerperal woman takes eggs for some days with her millet porridge. An ordinary and therefore suitable present at such times is a basket of eggs. Pigeon and plovers' eggs are added to soups. Ducks' eggs are preserved in a coating of lime, clay, spices, and rice husk mixed together, which excludes the air. After a while the yolk becomes of a deep green, nearly black colour. The longer the eggs are kept in this covering the darker becomes the colour of the yolk, and the greater the supposed delicacy. They are invariably on the table at all dinners of ceremony, and are to be seen on the street exposed for sale. Painted eggs both of the duck and hen are placed in the water in which Chinese babies are washed or wiped

on the third day after birth. Ducks' eggs in a state much less advanced than this are also to be had. Eggs, of course, contain all the constituents of food, and are, therefore, nutritious articles of diet.

Regarding poultry and game, little need be said. The farmyard poultry are the same in China as with us. Geese are sent at betrothals and marriages, to augur happiness and felicity. Hares (called wild cats in Chinese) are caught by hawks. All sorts of poultry and game are brought down frozen from Mongolia to Peking in winter, and include antelope, pheasants, partridges, wild boar, fowls, &c. China itself, from its dense population and scarcity of cover and protection, is not rich in game. Wild duck and snipe are shot by foreigners near the ports. Large numbers of birds particularly sparrows, are caught by gins, birdlime, and hawks, and sold for food. Other sorts are caught for preserving and training as pets, singing birds, and for acquiring various devices.

Among reptiles eaten by the Chinese, the hind legs of the large frog (*Rana esculenta;* "field chicken" in Chinese) are consumed. Here we may remark that silkworms, and locusts in seasons of plague, are boiled and eaten.

Fruits and Vegetables.

Of preserved meats and extracts, none exist in China. Salt, sugar, honey, and simple drying, are plans that are adopted in relation to fruits. Drying is the one most usually adopted. The fruits so preserved are prone, however, to become mouldy in presence of damp, of which there is enough in the wet season. Those substances preserved by salt, sugar, honey, or the two latter combined, reduce the proportion of water present, and so prevent the development of those low forms of animal and vegetable life which accompany and help, if they do not set up, decay. A species of zizyphus or jujube, not allied to the palm date, and frequently but incorrectly called black dates by foreigners, and under this incorrect name inserted in our

treaty with China, are prepared by soaking in honey. The persimmon (fruit of *Diospyros kaki*) is dried as a preserve, and large rolls of them are exposed on the streets. The appearance of a persimmon orchard resembles that of an orange grove. The fruit ripens very late in the season, and with difficulty, and consequently it is usually gathered unripe, and afterwards put into water-pots with hot water, covered tightly over and steamed. Some of the many varieties of this tree contain so much tannin as to render them unfit for food. The variety grown around Peking is edible, and might be introduced into European gardens as well for the beauty of its shape as its fruit. A jam is made from the pulp. The apple, apricot, and peach are also so dried and used as a preserve. A species of red fruit called *shan li hung* (*Cratægus*) furnishes a most excellent jelly called *chin kau*, and a favourite jam called *wĕnpo*, both of which are found at table. Vendors of this red fruit go about the streets with large strings of it across their shoulders, round their necks, or over their arms. The coating with a mixture of sugar or honey of the fruit of the *hai tang kwo* (Siberian crab) is a favourite preserve at Peking. The subacid of the fruit with the saccharine coating makes a delicious delicacy. Well-known preserves are also made from ginger and bamboo sprouts, for which Canton is justly celebrated. These sprouts are made by drying the young shoots. Lily flowers, the blossoms of the *Hemerocallis graminea* and the *Lilium bulbiferum* are dried and used principally to season meat dishes, ragouts, &c. They are also eaten in the same manner as fungus. Lily flowers are very largely employed in cookery, as a tonic or relish, with meat dishes. Chestnuts, lotus-roots, olives, peaches, pears, prunes, are salted, washed, dried, and placed in sugar as sweetmeats. Almonds, dates, persimmons, lotus-nuts, pine-seeds, ground-nuts, raisins, &c., are either eaten raw or cooked. Besides the dried fruits there are the dried vegetables, bamboo shoots, cabbage, turnips, salted. The young shoots of reeds supply a cheap vegetable. Nearly everything in China is preserved by being

dried and salted, or dried and candied. Then there are also the dried Lichi and dried Lungans, the fruit of the *Nephelium lichi* and *longanum* respectively.

China is rich in fruits—apples, pears, apricots, plums, cherries, peaches, grapes, oranges, persimmons, dates, figs, jujubes, and most of these of several varieties. The grape is peculiar to the north, being grown between 30 and 40°, N. Lat. The orange belongs to the south, and from thence it is said it was introduced into Europe last century. (It is also said that the German for orange, viz. Apfelsine, means China apple, or apple of Tsin.) The kernels of stone fruits (cherry, plum, apricot, peach) are eaten, are rich in oil, and have an aromatic and somewhat bitter taste. The peach is acknowledged to be the finest Chinese fruit. It is refreshing and agreeable, but does not contain much nutritious matter. Mulberries, both purple or black and white, are also largely eaten. The orange and pomelo (the supposed apple of the garden of Eden) from the south are well-known and highly appreciated fruits. The citron and pomegranate are grown in the open air at Peking, and form delicious and useful fruits. The rind of the latter possesses anthelmintic properties, and is therefore useful in the expulsion of the *lumbrici.* Fruits are consumed in most countries for the pleasant saccharine and oily nature rather than for any nutritive value they possess. In some countries the banana and the fig for the sugar, and the cocoanut for the oil they contain, are substantial articles of diet. Fruits are at all times valuable for the potash salts they contain. In South China and along the sea-coast and great rivers, where salt fish forms the chief article of diet, the blood loses much of its potash compounds, and has to be made up by fruits. Fruits, besides this, have other excellencies, acting both as stimulants to weak digestion, giving variety and lightness to solid diet, and contributing water to the system for digestion and assimilation in an agreeable and refreshing form.

In regard to condiments, spices and flavourers, the Chinese use principally capsicums, garlic, onion, ginger, cardamoms,

nutmeg, aniseed, cassia, cloves, pepper, &c. These are used in confectionery, in seasoning dishes, and as medicines. Mustard is not much employed by the Chinese, and its place as a counter-stimulant is supplied by the moxa and other forms of external irritation.

Cryptogamic (flowerless) plants are largely cultivated and eaten in China. The common mushroom (*moh kwo*) is never absent from the feast. The Chinese distinguish readily between the poisonous and non-poisonous varieties. Mushrooms are highly nitrogenous and contain much fat. The so-called tea mushrooms are said only to be produced in the Province of Kiangsi, and are regarded as possessing exceptionally nourishing and delicate qualities. There is great room in our country for the cultivation in almost every garden of these delicious esculents, whose flavour commends them to most palates, and whose nutritive value is as great as some other vegetables. Many species of mushroom, fungi, and mosses are edible, and it is only ignorance and prejudice that prevents them from becoming an article of every-day food. In Europe there are said to be some thirty or more kinds allied in flavour and excellence to the mushroom, which are eaten in summer either fresh or pickled in vinegar and oil by thousands of peasants. Its remuneration far exceeds that of any other vegetable and fruit. Mushroom growing is profitable also for the preparation of ketchup. On this subject consult 'Wright's Mushroom-Growing,' or an interesting summary of it in 'Chambers' Journal' for August, 1884. The fungus called *fu ling* is found adhering to the roots of fir trees, or in the ground apart from the trees. They are used as food, made with rice flour into cakes. The fungus called *muh rh* (wood ear), growing on trees, is similarly used. Various kinds of lichen or mosses are also largely consumed by the better classes. Various sorts of sea-weed are eaten in soups or are eaten alone with sauces. The Chinese are very fond of them, especially of the *Plocaria candida* or Ceylon moss. The exact nutritive value of fungi, mushrooms, lichen, mosses, and sea-weeds have not

yet been made out in the West. The value of sea-weed in scrofulous diseases, and especially in its discutient properties with relation to swollen glands, is recognised by the Chinese. By the use of sea-weed they say that glands as hard as stones may be removed. Here is the first germ of the therapeutic value of iodine.

The Chinese eat largely of salads. These are commonly made of turnips, cabbage, radish, lettuce, cucumber, &c. The salad plants, although not rich in heat-giving or flesh-forming matter, are comparatively rich in saline matter, particularly potash salts, which are usually extracted in the process of boiling from cooked vegetables. They are the means of introducing large quantities of water into the system, and in hot weather are very refreshing additions to richer foods. The radish is also allowed to grow to a comparatively large size, and is then eaten as a vegetable, nay almost as a food by the lower classes at Peking on account of its extreme cheapness.

We may as well finish here what we have to say as to tubers and vegetables generally. The potato has never become a vegetable in China. Except towards the Great Wall its use is entirely unknown. Indeed, until foreigners settled at Peking and Tientsin, the potato seems to have been unknown. When shown to the Chinese they could not tell what it was. And so it remains very much to-day. It is called "yam head." Only the very poorest along the Great Wall, inside and outside, would dream of eating it, and only in famine seasons. Tobacco was early introduced, and soon spread over the whole Empire. Its *confrère* the potato has not yet made its way in Cathay. In the West the two plants have gone very much hand in hand, having been introduced about the same time from America.

The yam, the edible roots of *Dioscorea alata* or *sativa*, is largely cultivated. On account of its higher price it is not so largely eaten by the common people as the sweet potato. The yam in chemical composition and taste resembles the common potato, or probably still more the so-called (but incorrectly) Jerusalem artichoke. The Chinese believe that

it increases appetite and conduces to corpulence, a condition of body very much sought after by the Chinese. A spare official would be an anachronism. I have often been consulted for medicine to increase bodily weight, but not once for drugs to remove obesity. The word for beauty in their language is derived from their early pastoral habits, viz., a fat sheep. The *sweet potato* (*Batatus edulis*) belongs to the convolvulus order. The tuber, which contains sugar, and in this respect therefore differs from the true potato, is largely eaten in the north of China. They are extremely plentiful and very cheap. They are usually boiled and eaten in the morning quite hot. After being boiled they are frequently sliced and fried for foreign use. *Turnips* are extensively used in North China, in the fresh state in season, and in the salted condition all the year round, of which it is partaken at almost every meal. Turnips and cabbages are the two most frequently eaten articles of Chinese diet both fresh and salted. They can both be had fresh nearly all the year through, and salted of course always. The Chinese pits of ice enable them thus to preserve vegetables fresh when otherwise they would be out of season. Even the delicate grape is in this way preserved fresh throughout nearly the whole year. The turnip, we know, is very watery, and contains but little nourishment. It is a cheap and agreeable way of introducing salt into the system, and it provides a flavour for the insipid rice. It differs from the potato in containing no starch. *Carrots* also contain no starch. They are not used salted. They are called *hung* (red) *lo pei,* in contradistinction to the *pai* (white) *lo pei* or turnip. In many of the succulent vegetables consumed by the Chinese, important mineral matter, such as potash salts and phosphates, together with vegetable acids, are present in considerable quantities. The *cabbage*, *pai* (white) *t'sai* (*Brassica oleracea*), is the most largely consumed of all vegetables in China, both in the fresh and salted, raw and boiled condition. In nutritive value it does not differ widely from the turnip. The Shantung cabbage is particularly noted. Large quantities of spinach (*po t'sai*)

(*Spinacia oleracea*) are also eaten boiled, but never minced as with us. It is a wholesome vegetable. The onion, both bulb, stalk, and leaves, is also largely eaten raw, with millet cakes, of which the meal of many working people is exclusively made. It is also cut up and put into small meat pies, as is also *chieu tsai* (*Allium odorum*), a strongly smelling vegetable which is extensively eaten and apparently relished by the people. The various species of *allium* are highly prized in China. Everywhere on the streets country men may be seen with long strings of garlic (*Allium sativa*) attached to the two ends of a beam carried over the shoulder. The bulbs are all strung together. The strong taste of the garlic, onion, and *chieu tsai*, which are due to a pungent volatile oil, rich in sulphur, are considered so disagreeable that foreigners usually forbid their use to their native servants. Garlic has always been highly esteemed by Orientals. It is said of a Frenchman that he was fond of garlic, which he said was the finest stimulant that nature had provided for human use, and the very best preservative against infectious disease. The celebrated Parr, who lived to a great age, is reported to have subsisted largely on garlic or onion, and to have died when he was deprived of his accustomed stimulant when he went up to London to wait upon Royalty. The Chinese onion, *tsung*, is not our *Allium cepa*, but *Allium fistulosum*.

Various species of the melon or gourd family (*Cucurbitacea*) are largely cultivated in China, and form in the hot season agreeable fruits and vegetables. Those found in the neighbourhood of Peking are vegetable marrows (*Cucuribita ovifera*), which contain more nutritive matter, starch and sugar, than their close ally, the cucumber ; the pumpkin is even more largely consumed, and is boiled as a vegetable to be taken with their rice. They form a wholesome and agreeable food of delicate flavour and pleasant consistence ; the egg-plant is also largely eaten, boiled, fried, and sun-dried. The cucumber (*Cucumis sativus*) is a great favourite and is largely consumed. It is to be had for several months during the very hottest season, when it is extremely grateful. In tropical heat the proverb "as cool as a cucumber" is by no means unappreciated. Many of the

poor people in summer make it their sole vegetable in conjunction with millet and rice. Cart-loads of it are seen daily in the Peking markets. They contain little else besides water, some grape sugar, and a trace of volatile flavouring matter. The rind of the cucumber, although said to be indigestible, is also usually eaten, and known commercially as shredded cucumber peel. All the gourd family require a rich open soil and much water. The wells that are dug so plentifully on the Peking plain, and the irrigation that is carried on, is with the view of supplying water to the melon tribe. A large variety of small sweet melons are found on the market. The usual cry of the hawkers on the streets is "Melons to sell as sweet as candy sugar."

Names at Peking in Romanised Chinese of the various gourds :—

Vegetable marrow	*Tung kwa.*	Cucumber.	*Hwang kwa.*
Pumpkin.	*Wo kwo.*	Water-melon.	*Hsi kwa.*
Egg-plant.	*Chie tse.*	Small sweet melon.	*Tien kwa.*

Fish.*

Fish forms a large portion of the diet of the Chinese people, especially of the south. As many as one-tenth, perhaps, derive their food from the water. As a widely distributed article of food, fish is a more important staple in China than in any other country, and has led to an extraordinary development of industry and commerce in marine and fresh-water fish. Many fish that are in Europe not deemed worthy of being caught, or if caught, rather for sport, and then thrown into the sea, form an extensive commerce, and the staple food of a large section of the inhabitants. Even the repulsive and hostile shark of Western nations becomes an article of commercial value, and is treated as a matter of food for the million. The highly nitrogenous character of fish demands the abundant use of starchy foods in order that the heat-givers and flesh-formers

* Information regarding the Chinese Fisheries will also be found in the Literature of the International Fisheries Exhibition, vol. x. pp. 171–181, and vol. xiii. pp. 423–426.

may hold a due proportion in the daily diet of the people. And this proportion is well maintained by the Chinese, for we find fish and rice constituting the principal articles of their daily food. Fishing has, therefore, at all times formed an important occupation of the people along the extended and tortuous sea-coast and the large rivers, canals, and lakes of the Celestial Empire. The wealth of the sea and rivers is enormous, but in the West this is either altogether unknown or unappreciated. The Chinese, hundreds of years ago, have discovered the philosophy that underlies fish culture as well as the best modes of increasing their supplies of fish. In China fish are plentiful and cheap. The people eat species of fish that are altogether rejected by us. In the interior ponds exist for supplying the markets of the nearest towns with the most popular sorts of fish. They yield a profitable return, but give an unpleasant muddy flavour to the fish, which, however, is corrected, as practised also in some parts of Europe, by placing the fish for a few days in clear water. Hundreds of thousands of fish are said by the Chinese to die annually of starvation; therefore means ought to be adopted of feeding the tender fry, and thus fish of all sorts would become more plentiful and cheaper. In China, the yolks of hens' eggs are thrown into the rivers and ponds as food for the young fish. A very small percentage of the ova of our chief food fishes come to maturity, and of those actually hatched, a very small percentage reaches us for food. The fecundity of all kinds of fish is enormous. Pisciculture is practically unknown in Europe—fish ponds are nowhere seen. Untold wealth and food are within our reach, as, until the discovery of minerals, untold wealth lay under our feet. Far more in the way of curing and preserving fish ought to be adopted for the immense shoals of herrings, for example, caught annually on our coasts, and which might be made to supply a necessary part of the diet of the people of these islands all the year round. With all our insular advantages, it remains yet to us to take full advantage of it. We speak often of the "silver streak" as dividing us from continental nations and saving us from panics and wars; we hardly ever

look at the watery element by which we are invested in its economical and commercial aspects. We speak of the rich land domain of the Gaul, but never of the richer marine one of the Saxon. Our seas and lochs ought to yield for us a richer harvest than our fields; our fish supply is abundant and accessible. Connected with fish curing in China, there is, of course, also a large manufacture of salt. The process of curing consists in simply saturating the fish with salt and subsequent evaporation of the sea water. The Chinese prefer to take the salt which their systems require in the form of salted fish and vegetables, as otherwise the vegetables would be insipid. Smoked fish do not find favour with the Chinese. The Chinese modes of fishing are simple and their implements ingenious, both characteristic of the people; and although thus simple and primitive they nevertheless answer the purpose admirably. Many of the Chinese means of taking fish are practically unknown to and unpractised by us. Shell-fish are largely cultivated, and add considerably to the food supplies of the people. Oysters are very successfully cultivated, and, considering their dearness and scarcity in Europe, a thoroughly scientific enquiry as to the methods pursued by the Chinese would undoubtedly yield important results.* The dried fins of a species of *Zygæna* are esteemed as food. At the International Fisheries Exhibition, held in London in 1883, over 300 species of fish from Swatow in the south of China, were exhibited, nearly all of which are edible. The gastric disturbance from the eating of some of the crustacea, such as mussels, oysters, crabs, lobsters, and other molluscs, which has been observed, may be owing to their coarse feeding, rather than to any poisonous properties they may possess. Fish-maws, especially cod-fish, are largely eaten, and form a large article of commerce. A large trade is also carried on in dried or salted fish roes, among which the roes of the mullet are both the most plentiful, and the best. Various sauces are made of fish and eaten as a relish

* Information on this head will also be found in the Literature of the International Fisheries Exhibition, vol. xiii. p. 22.

by poor people, as for example crabs. In the South Formosa (an island in the south of China) collection in the same Exhibition about 200 species of mollusca are given, two dozen species of crabs, and nearly a hundred species of various kinds of fish, the large majority of which are of good eating and many considered delicacies. Cuttle-fish, dried jelly-fish, sharks' fins are among the marine food supplies. The fins of the shark in soups form a great delicacy for the table. Anchovies, eels, crabs, shrimps, prawns, are caught in very large quantities. Dried holothuria (bicho-de-mar), dried stomachs of fish, dried shell-fish, dried prawns and shrimps, shrimp husks, and shrimp sauce form large articles of food and commerce. The cartilaginous dried skin of a fish allied to the sturgeon is used for food. The bones of fish boiled and clarified are also used as an article of food. Cows' and deer's sinews boiled with eggs, shrimps, &c., are taken by invalids as a restorative tonic. The bicho-de-mar is a marine slug, or trepang, sometimes two feet long, but commonly from four to ten inches, and in girth two or three inches, prepared by drying and smoking and used as a dainty. It is esteemed as aphrodisiac, and, like sharks' fins, has stimulant and tonic properties. The sea-slugs are dried and smoked, soaked in warm water for several days to cleanse them, and afterwards boiled in soups, stews, &c., like dried fish maws (sharks' stomachs dried in the sun), which are similarly treated. They resemble perhaps the French *Escargots de Bourgogne.* Birds' nests are the nests of a small swift known as the Salangan (*Collocalis brevirostris* or *esculenta*), elaborated by the bird from a sea-weed (*Gelidium*) found in the East Indies and the Straits, stewed into a jelly, and forming the chief ingredient of a costly and greatly prized soup at all feasts of ceremony. These nests are rather brackets for the nests. They come from Java and other islands of the Malayan Archipelago. They are formed of the salivary secretion of the bird. Mock birds' nests might be made of sea-weed, as the Japanese do,* by beating it soft and boiling

* See vol. xvii. of the Health Exhibition Literature.

it to a jelly. Such a dish might be made palatable and nourishing, and find a ready sale with us.

But not only are fish of immense value as an article of diet, but they are made subservient to other ends. Sharks' fins are made into gelatine, the prepared skins are used for ornamental purposes. The shells of the crustacea are gathered and burnt into lime, or used as a substitute for glass. The inner coating of a peculiar kind of oyster shell is used for this latter purpose. But not only are shells utilized in glazing windows and making lime, but they are made into a variety of other things, such as foghorns, spoons, rings, wine-cups, necklaces, head ornaments, &c. Tobacco-pipes, spectacle cases, drum-heads, &c., are made from sharks' skin. Sharks' skin polished makes a leather called shagreen. The Chinese have also introduced methods for the artificial creation of pearls in oysters and mussels.

Fish are not the only produce of the sea that is thus utilized for food, but the entire marine vegetable world is also laid under contribution. Sea-weed (*Agar-agar*, the Malay name of the marine algal, *Plocaria tenax*), a glutinous jelly prepared from the marine algal, is used for sizing, and forms an edible jelly, and is used as food by the poorer classes. The Japanese have an edible form of a species of Laminariæ and of Florideæ, which when boiled to a jelly is used for food. The holothuria and birds' nests may be reckoned also in this category.

The extensive capture of fish in the Chinese waters for the last two or three thousand years proves conclusively that the sea cannot be depleted of fish. The Chinese are continually catching small fish in and out of season. No doubt the greater warmth of the waters tends to the greater production—ten thousand-fold perhaps greater than in our colder temperature. Still, even with us the numbers produced are beyond calculation. In China, too, no protective laws exist. It may be interesting to remark that neither the salmon nor the trout are found in China, although without doubt they could be introduced and reared. And also that fish in China, wherever possible, are sold alive—being hawked about the streets or sold

in shops in shallow tubs containing a very little water. When bought they are carried off by a string attached to the dorsal fin.

Vinegar.

Vinegar (*tsu*) is extensively used by the Chinese. Hawkers are common on the streets who dispose of vinegar and the purified and unpurified sorts of sesame oil for cooking and lighting respectively. The Chinese seem to consume vinegar with everything. Among the Jews the same use of vinegar seems to have prevailed. "At meal time come thou hither and eat of the bread and dip thy morsel in the vinegar" (Ruth ii. 14). It is extensively used as a condiment in salads. It is added to their vermicelli and vegetables. The Chinese have no pickles.

Carbon Compounds or Heat-Givers.

The consumption of *sugar* (*t'ang*) is enormous. It is an important ingredient in most dishes, and the variety and quantity of confectionery and cakes in different forms manufactured from and with it is astonishing. It is said that next to rice it is one of the chief constituents of nearly all the Chinese vegetable meals. At a dinner given to me by the family of a late metropolitan Viceroy, every dish was seasoned with sugar, from a belief, for which the whiteness of foreign salt had given occasion, that foreigners mixed sugar with all their dishes. It is highly prized, and considered a valuable curative and prophylactic medicine. It is used by the French also in a medicinal way. After severe injuries or in syncope, or after operations and illnesses, sugar is at once had recourse to, the black in certain cases, the white in others. The extreme whiteness of the foreign article makes it much sought after for "confirming the heart." The servants of foreigners largely pilfer their masters' saccharine stores for the purpose of supplying this craving. After nauseous draughts of medicine, sugar-candy is always the resource. The sugar-cane is largely planted in the south. Sugar is not by

any means cheap, and it is apt to be largely adulterated with sand. Like salt, it is very largely abstracted during transit, and its place supplied by stones, &c., to make up the weight. On account, therefore, of its dearness sugar is esteemed a luxury as salt is a necessity.

China grows no beetroot. In the south sugar-cane is sold in the streets, and in North China Indian corn is largely chewed for its saccharine properties. Owing to the ravages produced by the phylloxera in France, more attention has lately been paid to the production of sugar, and the sugar millet (*Sorghum saccharatum*) has thus been more largely grown, especially in Central France, sugar forming a most important article of consumption (*eau sucrée*) and commerce. The seeds of the various kinds of *Sorghum*, which are largely grown in the north, and extensively consumed by man and beast, contain much sugar, and are very nutritious. The Chinese preserve many of their fruits in sugar. Honey, too (*feng mi*), is somewhat largely used. Diluted honey or sugared water is applied to the hands and face prior to the application of rouge by the women, with the object of making the latter adhere.

Starch (*fen*) enters largely into the Chinese nutrients, and forms with sugar and fat the trio of oxidizable carbon compounds or heat-givers. The rice, wheat, maize, millet, peas and beans which are so plentifully consumed in China contain it in from about 40 to 80 p.c. It is also found in many of their succulent fruits. From the roots and dried stems of the lotus or water-lily (*Nelumbium*) a kind of arrow-root is produced which is somewhat largely eaten, and is about the only article of diet besides rice-gruel suitable for invalids in China, and to which they invariably have recourse. Indeed, there is no part of the lotus plant which is not turned to account by the Chinese.

Salts in Food.

Common salt (*yen*) in China is of a very coarse, dirty-white, moist description. It is a Government monopoly as

in India, and is manufactured in vast quantities in the neighbourhood of Tientsin and stored there in large hillocks. Other salt manufactories exist in other parts of the Empire. They do not think it necessary to re-crystallise and so purify it. It doubtless contains other saline substances or impurities derived from the sea water from which it is evaporated. Any bitter taste it may have would indicate the presence of chloride of magnesium. Salt is chiefly consumed by the Chinese in the form of salted vegetables, fish, and fruits. There can be no question as to the great value of chloride of sodium, pure or otherwise, in the human body, and especially to rice-eating people. The Chinese diet being so largely vegetarian, there is the absence of common salt, and this substance has therefore to be largely added to the dietary of Oriental people, and so becomes an important article of production, consumption, commerce, and taxation. So universal is the use of this —to the human body—indispensable article, that some have proposed to judge of the population of a country by the amount of salt consumed. Scurvy is unknown in China. Although much salt is consumed, fresh green vegetables which are rich in potash salts are also largely partaken of, and these counteract the bad effects of salt-meat diet in the human body. The chlorine of the salt helps to furnish the hydrochloric acid of the gastric juice, and the chlorine of the chloride of potassium found in red blood corpuscles and in muscle. Its sodium forms part of the soda salts which are the characteristic constituents of the bile and of the phosphate of soda of the blood. The Chinese give it also regularly to their domestic animals, the horse, the camel, the cow, &c., to whet their appetite and increase their feeding properties. The people also partake largely of dry seeds, as for instance melon seeds, which usually contain much phosphate of potash; and fleshy fruits and growing parts of plants of which they are also very fond contain many potash salts of organic acids, which are changed in the system into carbonate of potash This is found to be very stimulating. Seeds and fruits

which are so much eaten contain much phosphate of lime or bone-earth, which is essential to the hardness and strengthening of the bones and teeth. And so it is that we find so rarely, if at all, the disease known on the continent as the "English disease," viz., rickets, and the whiteness and fineness of their teeth must have often been observed.

WATER.

As water forms more than two-thirds of the whole body, and is the carrier of food into and through the system, we have now to consider this most important constituent of food, and we hope some useful lessons may be learned from the Chinese use of this article. We shall here refer only to the liquids drunk as beverages, and not to those contained in solid foods. Suffice it, however, to remark touching this latter point, that the water in vegetables ranges from about 14 p.c. in maize, wheat, peas, beans, and rice, to 40 in bread, and 90 in cabbage; and in animal foods from 22 in bacon to 72 in eggs and 74 in fish. Although food thus contains so much water, it is found necessary to consume water itself, or beverages like tea which contain little else than water.

The chief sources of water supply in China are (1) wells as at Peking. These for the most part are deep. They are to be found in all the great streets and lanes, usually with a little shrine containing some clay divinity under whose protection the well is placed. Willow trees are usually found planted close to these wells, so that a grateful shade in summer is procured while man and beast drink of the waters. These wells usually alternate on each side of the streets. In Peking they are all let out to natives of *T'eng chow fu*, in Shantung, who charge a small sum (6 or 8 buckets for a penny, according to the quality of the water; the wells being so near, distance does not affect the price, and when celebrated sweet water is got from a distance it is brought in wheelbarrows or in carts at a slightly increased price), which includes the water, its drawing by hand

buckets, and its carriage to the private houses. Persons are allowed to drink gratuitously from these wells, but all animals except dogs are charged at the rate of about 24 drinks for one penny. The neighbouring shops and dwelling-houses without wells of their own are supplied from these sources. Private houses of any pretensions have usually one or more of such wells in their compounds. But as the water improves by frequent drawing and the brackish becomes more so by standing, and is destructive to flowers, and too hard for infusion of tea, the people are in the habit of purchasing water from the public wells, where the water is improved by constant drawing, and some of which are quite celebrated. The wells, occupying the sides of the thoroughfare as they do, are, strange to say, in close proximity to, though much deeper than, the drains, which carry off the surface water. This surface water and the large pools of water which collect at, and arise from, the surplus and waste of the wells themselves, and from which the streets are watered during dry weather, does not seem to injure the water of the wells. It usually has to percolate somewhat deeply through the soil before finding its way back into the well. The drains are now blocked up for the most part, and it is only here and there that they are opened once a year, in the spring, and cleaned out for short but interrupted distances. But, whether pervious or not, it must be remembered that no sewage in our sense of the word enters these drains, except what surface filth, urine, garbage, shop refuse water, &c., may exist on the surface of the streets or be emptied into them from the shops and houses. Even this refuse water is used for watering the streets. It is a convenience to the owners of the houses and to the police to have it so utilized. The wells in the country are on the whole shallower and are usually near streams, but do not receive any surface soakage. Some of the best wells in the city are often in proximity to places which are enough to cause a shudder to the foreigner accustomed to the sanitary science of the present day in the West. The habit of boiling the water

for all purposes, of allowing it to settle and of never, or very rarely, drinking cold water, prevents any injurious influences from arising. But even as in the case of the foreign use of this water, where it may not have been boiled or passed through a filter, I have not seen any bad effects. The water is always pure and cool when drawn and is agreeable to the taste. It may not be economical for washing, the presence of the salts of lime and magnesia rendering the formation of a lather with soap extremely difficult ; nor is the water at all pleasant for the purposes of the bath and ordinary ablution ; but my experience does not lead me to think the brackish waters of the east of Peking at all unwholesome, nor have they been found to produce calculous diseases. This is not the place to enter into a discussion regarding the formation of calculi. The Chinese all over the Empire, except in Canton and the extreme south-east of China, are wonderfully free from stone. Why it should abound there when the conditions are the same as elsewhere in China, and where river water, precipitated and boiled, is exclusively used, has not yet been ascertained. To the Chinese, who use little or no under or table linen, napkins, &c., washing is not the important matter it is in Europe, and as they invariably wash or rather wipe, their hands and faces with hot water (they cannot understand how Europeans should treat them so uncivilly), they do not experience either the hardness of the water or the waste of the soap. The Chinese use no filters in our sense of the word. Precipitation is the only plan they have recourse to, and even this but seldom, except in the case of muddy river water. No epidemic of any kind, so far as I am aware, has ever been known to arise from these wells. The Chinese have never attributed any bad effects to their well-water, and as a rule the people are not at all particular as to the source of their supply or the possible contaminations. The custom of boiling and drinking boiled water only may have led them to be careless on this point. In China one never hears of a well being shut up because it was pronounced unsafe or its sanitary surroundings dangerous. There are

no guardians of public health or sanitary officers, and only what has been sanctioned by custom is binding, and as their forefathers drank of these wells, both they and their cattle, so do they of the present generation. Broken reed buckets are often left floating in them. If by any chance the drainage, or a dead cat or dog should have found their way into the well and contaminated the waters, or if the sides of the well should give way, then the owners or renters of the well empty it and remove the offence or repair the damage. As the well is a commercial transaction it is the interest of the renters to supply their customers with pure and good water at a moderate rate. They thus find it to their advantage to carefully guard their wells against all sources of pollution. The safety of these wells lies largely in their depth, being often as many as thirty and more feet. The organic matters in this way which may be carried down are oxidized or burnt on the passage down. Moreover the rainfall is generally so heavy in China as to carry off any surface contaminations into the streams or roads (for in wet weather the roads are the watercourses), and therefore not allowed to settle down on the lands and percolate into the wells. This may be true of the country wells. In Peking in the wet season the streets form dirty lakes and ponds, which lie for days and weeks until a bright sun and a northerly breeze evaporates and dries them up, and then the streets, as before, are filled with clouds of black dust which insinuates itself into every nook and cranny. Yet even from this no harm has come. The waters of the deep wells are usually harder than the more superficial wells, owing to the larger quantity of calcareous, magnesian, and alkaline salt they have dissolved out in their long course underground. Boiled water has lost the gases which are dissolved in the water, and therefore tastes insipid. The Chinese do not seem to sustain any damage from their use as a beverage of pure hot or warm water. The warm water does not seem to weaken the stomach, but rather tends to cleanse it and prevent the accumulation of injurious gases or other impurities and crudities. The

practice is certainly worthy of a trial in the West. Some Europeans who began with a strong prejudice against pure hot water have ended in becoming its adherents and advocates ; and one missionary in the north lately informed me that each winter, until he began the use of the hot water in the morning, he was the subject of rheumatism, but now he is entirely free. This gentleman at the same time is a rigid total abstainer from intoxicating drinks ! The hard waters of Peking leave a copious deposit in the kettles. To prevent this a tuft of cotton wool is inserted in the vessel, or vinegar is boiled, or mechanical force applied to remove it. The waters of the wells in the east of Peking contain carbonate of lime in abundance, along with sulphates, chlorides, and nitrates of sodium, magnesium, &c. The water gives a heavy, dense, cloudy precipicate with nitrate of silver. The water of the wells, except after heavy rains, when leaves, blossoms, and seeds of trees are blown or carried in, or the surface water from such flows in, does not contain any large amount of organic matter.

(2) *Rain water.*—The Chinese usually do not use rain water except for their flower-gardens, infusion of tea or washing of clothes. The rain water falling so heavily and not passing through air contaminated with chimneys and manufactories of large towns as in Europe and America, is comparatively pure, although of course it must always contain some impurities both suspended and dissolved. In collecting it sufficient time must be allowed to thoroughly cleanse the tiles of the roof, which retain a large amount of dust, organic, and calcareous matter, and which is largely deposited in the collecting vessels. The rainfall in Peking is on an average about twenty-six inches annually, or not far from that of the London district and North Germany. There are no slate roofs in China ; all the houses have either tile, mud, or lime roofs.

The land in China is never drained ; forests and abundance of trees cannot be said to exist on account of the poverty of the people and the necessity of bringing every

inch of land under cultivation. In the summer much of the storm water runs off into the river courses and deep roads, which are almost the same thing. Apart from the rain of thunderstorms, the usual rain of the wet season falls slowly, steadily, and for successive days, thus percolating into the soil. Water is found everywhere, often at no great depth, and even in the driest season the deeper wells on the plains never lack water. The amount of water consumed by a Chinese family is, of course, nothing to what an English family consumes. There is no waste with bath, flushing water-closets and drains, and washing either of clothes or dishes. No artesian wells exist. In seasons of drought the crops suffer, but, except in elevated regions, there is always sufficient water for man and beast. All water requiring to be laboriously drawn, carried, or bought, there is no waste of water as there is too frequently with us. Water is of the first importance to man, and his first inquiry therefore before settling down anywhere is the presence or absence of this indispensable liquid. At Peking several foreign families have dug large cisterns, into which they have the water from the roofs of their houses drained, and from which a plentiful supply of soft water is to be had throughout the whole year, for washing, and for watering their flower-gardens in spring and autumn. Whenever it rains, as soon as the roofs are sufficiently clean, the Chinese collect the rain in basins and all manner of vessels for domestic use and tea infusion. An ordinary foreign dwelling-house at Peking, and supposing one-third lost by evaporation or absorption, would still supply about three gallons of soft water *per diem* for the whole year. If rain should fall during one of the frequent dust-storms which darken the sky, it will be found to be mud, staining everything it falls upon. This is the explanation of showers of mud. The rain is sometimes so violent that hardly any one ventures out in it. With the rain, hailstones sometimes fall as large as walnuts or pigeons' eggs, and do much damage to crops and roofs.

For drawing water from the wells for domestic use, or

for irrigating their fields, they use very simple utensils. The most common is a basket with a rope over a pulley, or windlass. The water-wheel is extensively used in irrigation, or a bucket with a large stone at the other end of the beam to which it is attached. The rainy season at Peking extends from June to September, and the rest of the year is dry, with a slight fall of snow and a few gentle showers of rain in April and May.

(3) *River* water is largely used. The rivers are for the most part large, flow rapidly, and are very muddy, conveying great quantities of earth to the sea. Instead, however, of mud being a disadvantage, it is the means of purifying it, and the water so collected is first allowed to settle in vessels for the purpose, being first stirred with a rod into which a few small pieces of alum have been inserted, and which has a few small perforations to allow the water rapidly to pass in and out, as the rod is rapidly stirred through the water. A wonderfully small quantity of alum is sufficient for the purpose, and the water never tastes of it. These rivers are not contaminated as in Europe with the direct or indirect inflow of sewers from dwelling houses, the foul discharges of factories, the droppings of farm animals pastured on their banks, although, as the rivers run past towns and villages, a large amount of filth runs into them from the banks. But besides the purifying character of the mud, and generally the great bulk of the water thus largely diluting any impurities, the practice of boiling all water for cooking, tea infusion, or drinking, is *cæteris paribus* a great protection and wise measure. The Chinese stand aghast at the large quantities of cold water drunk at meals by foreigners, and especially Americans, adults, and children. The Chinese would in such cases replace it with tea, and some foreign families have adopted the same rule with great advantage. In tropical countries it at least averts the danger of diarrhœa and dysentery. Except for preparing tea, of which large quantities are drunk all over the Empire, and all day long, the Chinese are not great drinkers of simple water. Their food, particularly their

rice gruel and fresh vegetables, contains a large quantity of water, much more so than European food. With the Chinese precautions, river water for drinking and cooking is without objection. It is soft and sweet, and has not been found fraught with any risk to health. At tidal places, particular states of the tides are observed for the collection of the water supply from the large rivers, such as the Son of the Ocean, Yellow, North, and Pearl, whose volume of water and quantity of mud carried down is so great as to affect the sea for great distances. River water does not seem to contain disease-producing organisms, and they do not develop, propagate, or exist in such water so as to be capable of acting prejudicially.

(4) Spring water is frequent, and highly valued. In the neighbourhood of the capital are the celebrated springs flowing out of the Jade Fountain Hill, forming first a beautiful lake in front of the Hill of Myriad Years' Longevity (part of the Imperial summer palace), and the water then led in a canal to the city, fills ornamental lakes in the Imperial city, and the moat which surrounds it and the Tartar city, and from which in winter the large blocks of ice are taken to be stored along its banks for summer use. The water of these springs is soft, palatable, and wholesome. The Emperor and his harem drink of these waters, brought daily from the spring, a distance of nearly ten miles. Medicinal or mineral waters are also found in China, but are not much used either from a sanitary or therapeutic point of view. In the neighbourhood of the capital there are the Imperial hot alkaline baths in the north, now in a state of decay, where the water, issuing from the two closely adjoining fountains, reaches a heat of 110° and 120° Fahr. respectively, and hot and cold sulphurous baths in the Western Hills at the Temple of the Azure Cloud, and the *Wen chuen* (hot fountains).

In the Chinese use of well, river, or canal water there is the entire absence in the streets or houses of iron, lead, or clay pipes, and consequently the people are free from those dangers that are said to arise from the use of these conveniences in Western countries.

During the great heat of summer in the north, when the thermometer rises to and above 100° Fahr., ice becomes almost a necessity of existence. It is employed and largely consumed to cool the air of the rooms, and the various fruits which are so plentiful but liable to rapid decomposition, and to preserve them and meats. The winter is long and sharp, the thermometer occasionally reaching zero by night. A large, plentiful and cheap supply of beautiful ice is secured and stored, in large square blocks about two feet thick, in pits covered with matting and earth. It is carted from these pits outside the city gates to ice-stands on the streets, whence it is distributed. The people in the towns round Peking are not allowed to collect and store the ice blocks from their frozen rivers, the sound and tone of the word ice, *ping*, being the same as that for soldier; and the presence of so many thousand blocks of ice might be a standing menace to the dynasty, and endanger the peace of the capital! There poor people dig pits in their courtyards to preserve their vegetables in winter and their pork in summer, and for the production of their acid rice water they are obliged to send to the capital for ice.

Having pointed out the source, quality, and mode of use of water by the Chinese, it remains in this connection to refer to their other beverages not purely water. And first in importance of course stands tea, *ch'ha* in Peking, and *te* in Fukhien, from the pronunciation of which latter province Europe has derived the name of the plant whose infusion "cheers but not inebriates."

Beverages.

Tea is and has been for many centuries the common beverage of China. It is refreshing and invigorating. It has little nutritive value. It increases respiratory action and excites the brain to greater activity. The stimulating effects are due to the essential oil and the theine which it contains in common with coffee and cocoa, which are unknown in China. Tea is never used as a meal in China. It is drunk at all times, hot in winter, usually cool or cold

in summer. The astringent and bitter matter in the tea is tannin, which is extracted after long infusion. The Chinese do not infuse their tea long, but drink it almost as soon as the water is poured on. The tea-leaf is not manufactured in any way ; it is the natural pickings of the tea-shrub, dried and flavoured, at Peking with the flower of the jasmine or *monihwa*. The value, tenderness of the leaf, and consequent aroma, are decided by the pickings being early or late, small or large, tender or coarse. The tea is usually infused in a covered cup and so drunk. The water, which is always boiling, is poured upon the leaves. The colour is of a light amber tint. No milk or cream, of course, and no sugar is added to the tea by the Chinese. The Russians, who drink excellent tea, add lemon and sugar, and the tea is drunk usually out of tumblers. The water with which it is infused is also always hot from the samovar. A small but strong quantity of tea is infused, and the tumblers are filled up from the samovar. The vessels used are all heated with warm water before use. The tea itself is of excellent quality, and is carried from T'ungchow near Peking across the Mongolian plateau on camels' backs. Brick tea is largely used in Mongolia as a beverage and as a medium of barter. The tea used by the Mongols is brick tea, very coarse, cut by a hatchet rubbed between stones and thrown into an iron pot in which the mutton has been boiled ; butter or sour cream and a handful of meal or millet and a little salt are added. This mixture is therefore more like a tea-soup. This brick tea is made of stalks, dust and refuse tea mixed with rice water and pressed into a mould which frequently has some auspicious Chinese character impressed upon it. Tea-dust, which is the refuse, broken and partially pulverised leaf, is used by the poorer classes. Good tea is dearer and more difficult to get in China than in Great Britain. The best Chinese tea is invariably of the first pickings. Tea in China is sold usually in small packets sufficient for one infusion. It is presented to every guest immediately upon entering the house or waiting-room. Foreigners often err in not following in

this respect the Chinese fashion. It is a necessary part of a polite and friendly reception, and is never denied to or by any one, however poor. How much better is this custom than the one which formerly ruled in the West, but which, fortunately, is now fast becoming obsolete, viz., the offer of wine or spirits on all occasions of ceremony or reception at births, marriages, deaths, &c.

The quality of our tea would be greatly enhanced and the cost of its transport vastly diminished if brick tea made from tea-dust were adopted. It requires only to be introduced (of course at very considerable expense of advertising) to meet with a ready sale. A better and cheaper beverage could thus be secured, the risk of adulteration, at least after leaving the manufacturer in China, would be obviated, the risk of damage from sea transport would be diminished, and the loss of aroma would be obviated. A quarter of a pound of tea compressed by hydraulic pressure can be reduced to a solid little block that can be carried in the waistcoat pocket. From compressed tea, too, more extract is obtained. Tea-dust is richer, weight for weight, than the unbroken leaf. The subject is worthy of consideration with our yearly increasing consumption of the article.

Among other beverages in use, the best known is the summer drink known as acid congè, made of rice water into which a little sugar, vinegar, and ice has been placed. This and tea are sold everywhere on the streets. The extensive use of boiled water as a beverage has already been referred to several times. The water-melon, which consists almost entirely of water, and which is largely consumed in summer, may without much impropriety be considered a grateful and, when iced, as it usually is, a cooling beverage. In the better classed families an ice box stands in the centre of the chief room, which helps to cool the apartment, and at the same time keeps the fruits used by the family in ice.

In regard to the consumption of spirits and wine, no more temperate nation exists on the globe—intoxication being almost unknown—and yet, nevertheless there is a

comparatively large consumption. Spirit is remarkably cheap ; no licence is required to sell it—no public-houses exist (except tea restaurants, concealed opium dens and theatres). There being no public bars, the Chinese are not to be seen muddling themselves as in our country, mixing their drinks with indecent language. The British public-houses form vast institutions of demoralisation, and if the people were not ripe and ready to be degenerated, the public-house would not attract them. The only spirit in existence is a coarse sort of whiskey called *samshoo* (thrice fired), distilled from rice and millet, and containing a large quantity of the poisonous ingredient known as fusel oil. A very small quantity suffices. Before the stage of intoxication is reached the drinker is warned to desist by the fiery feeling all over his body (his face and eyes glow). Two or three *cash* worth (10 or 12 *cash* equal to a penny) is the ordinary amount spent upon this liquor at meals by a very considerable section of the middle and lower classes in the north. I have known, however, a few inveterate drinkers who accustomed themselves to as much as a pound and more daily without being intoxicated. The insidiousness of dram drinking in the West consists largely in the multiplicity and fragrance or palatableness of a great number of our drinks. Spirit is more largely drunk all over China than is generally believed by us ; the impression that opium has taken the place of spirits is quite erroneous. China has settled the question how to consume intoxicating liquors without being drunk and without sustaining any very great injury therefrom, although the people themselves attribute nearly all their diseases to either anger or spirits. Fatal stricture of the gullet, said to be from this cause, is certainly more common in China than in Europe.

The Chinese plan of licensing no houses for the sale of ardent spirits is remarkable. As a food adjunct, why should its sale be regulated and controlled any more than tea or coffee? The Government revenue from the duties, which could be profitably increased, need not be diminished, but rather increased by an arrangement of the mode of collection

which should be entirely at the place of production or import, and not at the place of consumption. Allow every person to sell drink at pleasure in houses or on the street without regard to adulteration by water or other harmless ingredients. The question of vested interests would cease to exist, the profits would become so small that few would care to begin or carry on the trade, and there is good ground for the belief that the evil would cure itself. It would become almost self-destructive, public-houses would cease, and if other measures were carried out for the amelioration, amusement, and instruction of the working classes, and, above all, a radical change from the animal diet, which demands, if it does not require, spirituous adjuncts, to a simpler and more vegetarian dietary, a great and decided improvement would be the consequence. It is absolutely necessary to guarantee also an abundant supply of pure water, for impure water causes not only an increased death-rate, but promotes drunkenness, an impure state of the water supply being made the excuse for indulgence in fermented or spirituous liquors, both at home and in the East. Strong drink is neither a necessity of our constitution nor our climate.

Has the Christian faith less power over its adherents than the false and practically inoperative tenets of Buddhism? Must the modern West, with all its boasted civilization and progress in arts and sciences, learn from the hoary East, with its heathen and effete systems and rules of morality, lessons of sobriety and self-restraint, rules of living and practical health?

Contrary to the generally received opinion, alcohol lowers the temperature of the body. Were this vital point clearly apprehended, drink, which is so often taken for its supposed heat-giving power, would receive a fatal blow. Were the working classes supplied with some cheap and wholesome beverages—and in the event of chemistry failing to suggest a suitable one, might not cheap tea, or coffee, or cocoa, or even acidulated rice water and plain boiled water be adopted?—the public weal and the individual health, both

physical and mental, would be greatly benefited. The British national drink bill is one of the most astonishing facts of the age, as it is the most astounding commentary on our boasted prosperity, civilisation, and Christianity.

But besides the *samshoo*, the Chinese have what is called a yellow wine not unlike our weak sherry, which is largely consumed hot out of small wine-cups at feasts of ceremony. It is the only alcoholic beverage drunk on such occasions, and is much less injurious than the *samshoo*, which, being a strong spirit and possessing a sufficiently inflammatory character, is not heated. The spirit, because of its strength, and still more on account of its fusel oil and the absence of those other ingredients which modify the effects of alcohol in other beverages, is decidedly injurious to many constitutions even when consumed in very moderate quantities and in the weakest and most diluted liquors. What the physiological value, if any, of heated wine is has not yet been determined. It is pleasanter to take, but this may be the mere accident of the presence or absence of a particular flavour. More is apt to be drunk when hot, as is perhaps the experience of drinkers of hot cups at home.

There is no wine, in our sense of the word, in China. In the north the grape is cultivated to great perfection, but no wine is prepared from it. Even the Roman Catholic priests at Peking, who prepare much of their own ecclesiastical and domestic wine, have imported the vines from Europe for this purpose. The beautiful vines forming such a handsome and shady alley to the Portuguese cemetery at Peking are said to have been so obtained. The vine is not indigenous to China, although a wild sort is said, I believe in their Great Herbal, to have been found in Shansi. The Chinese face appears after drinking wines not unlike that of the Indian toddy-drinkers, whose eyes are described as becoming the colour of rubies, or of coals of fire. Tea should replace in our convivial gatherings all spirituous and expensive beverages.

A leading British merchant in China thinks that in the future, with the advent of machinery for coal-mining,

large quantities of cheap alcohol will be exported to Europe from China. Much cheap and good alcohol is at present produced in China, and the impulse given to the production by cheaper coals will enable it to be imported into England at a cheap rate. Is this in relation to our having forced opium upon the Chinese a "coming full circle of the wheel?" It certainly will be a strange turn in the wheel of fortune.

Betel-nut (*Areca catechu*) is used very much as a masticatory, and is supposed to sweeten the breath, rectify and strengthen the stomach, and preserve the teeth. The leaves are not chewed with lime as in India, hence there is the absence of the unnatural red gums, teeth, and lips of the Indians. The stimulant effects of betel, like those of tea, are not very great in China.

NARCOTICS.

Tobacco (smoke-leaf, tanpaku) is universally used by men and women from the period of puberty, which is somewhat early. The tobacco is very mild, has less strength and flavour than that commonly used in Europe. None is chewed, and but comparatively little taken in the form of snuff. Snuff was introduced by the French Catholic missionaries, hence to this day the chief sellers of snuff are Roman Catholic converts, and the *fleur-de-lis* is the emblem of a snuff-shop in Peking, just as a Highlander is of the same article in London.

The leaves are dried in the sun and then tied into large bales. The leaf is cut with large planes into very thin shreds, and looks then like Turkish and Hungarian tobacco, to which it is similar in weakness, though scarcely comparable in flavour. Tobacco was introduced into China over 200 years ago, and although it was stringently objected to and edicts issued against it, it soon became common throughout the country. It was introduced from Manila to Amoy in the south, and from Manila, through Japan and Corea, into Manchuria, and thence into North China, at the

end of the Ming dynasty and beginning of the present Manchu dynasty.*

The tobacco pipes are of two sorts, a water pipe and a small headed brass one. The former is filled with fine shred tobacco. After one or two whiffs the exhausted tobacco is blown out to clean it or knocked out of the other. The pipes are refilled and smoked, and the operation repeated until the smoker is tired or satisfied. The dry pipe has a jade or brass mouthpiece, the water one a brass mouthpiece with the box containing the water and tobacco and lighting paper covered with sharks' skin or cloth. (The sharks' skin in China takes the place of those obtained from alligator and boa skins in the West.) The upper classes have boys or slave girls who fill and light their pipes for them. The tobacco of the water pipe is sometimes steeped in an opium solution. The smoke of the water pipe is cool and free from nicotine. I have never observed any bad effects result from the Chinese use of their mild tobacco. The people consider it perfectly harmless. I have seen a child leave the mother's breast and take to the mother's tobacco pipe. (Weaning hardly ever takes place in China before three years of age, and sometimes as late as five.) Among Europeans in China I have found its excessive use in one or two cases followed by a disordered state of the nervous system, affecting vision and hearing. And this condition was doubtless owing to the nicotine, which, like the morphia in opium, is found in tobacco. If this soothing narcotic is to be indulged in by our people, a mild and unadulterated tobacco like the Chinese, drawn through water or smoked in very small pipe heads, is advisable. If it be true, as is asserted by smokers, that smoking cannot be detected, and of course, not enjoyed *in the dark*, the adoption of the water pipe would please another sense, viz. that of hearing, a peculiar gurgling noise being produced by the smoke as it is drawn through the water. The China leaf might at

* Consult the author's 'History of Opium and Opium Smoking and other Narcotics in China from the Earliest Times' (in preparation).

least be used (like the milder tea of China to mix with the stronger Assam variety) to mix with Spanish and American tobaccos, instead of using spurious adulterating substances. Tobacco, opium, and hemp seem to a large extent to have taken the place of alcoholic beverages in the East among the followers of Mahomet and Buddha, whose religions proscribe the use of wine. These faiths have thus contributed to the sobriety of peoples who have embraced them. The strong Western tobaccos seem to provoke thirst, and so prove incentives to alcoholic excess and its attendant evils. The kind of tobacco, the manner in which it is consumed, the amount smoked, and the time it is indulged, require to be taken into account in estimating its injuriousness. The effects of cigars are said to be greater than cigarettes, and these than pipes. When the smoke is conducted through water, the deleterious effects of tobacco are reduced to a minimum. The light-coloured tobaccos are the mildest. When inhaled in small quantities and not into the lungs, the action of tobacco is very slight.

China tobacco is much milder than the lightest home tobacco ; the *shui yentai* (water pipe) purifies and mellows the smoke. There is no eating of the dry leaf with moist quicklime as in India, nor is there anything resembling the Indian *hookah*, in which is consumed a paste of tobacco mixed with the spices and charcoal.

Opium (great smoke ; foreign earth ; foreign medicine), like tobacco, ought not properly to find a place in a paper on food, for they are neither foods nor food adjuncts. Opium is now largely cultivated in China and introduced (by treaty right) into the open ports. Both the growth and consumption seem extending. There is also a widespread desire to be relieved from the thraldom of the pipe. In presence of the Indian drug, the right to introduce it on the part of foreigners—the difficulty or supposed impossibility of the Indian revenue doing without the large annual revenue derived from the consumption of the opium in China—the widespread corruption of the Chinese officials and poorly paid underlings—the emptiness of the

Imperial exchequer—the call for money to meet military preparations and pay war indemnities (some of them waged to keep out this very drug)—the difficulty (in the view of some, inadvisability) of putting down the native growth in presence of the forced foreign article for which there is so great a demand, and especially as any introduction of the native would lead to an increase of the Indian and consequent further impoverishment of the country—the Chinese Government has felt its hands tied, and her past experiences have not encouraged her to resort to the last extremity. The unanimous opinion of the Chinese people, smokers and non-smokers alike, is that the habitual use of opium is hurtful. Medicinally it is invaluable; as a luxury its great tendency is to become a vicious habit. It consumes what should be spent upon the necessaries of life. The moment food is taken by the smoker the craving for the drug returns.* He has habituated himself to satisfy the craving at that time. I have lately met an inveterate English opium-eater (daily consumption of four ounces of Battley's sedative solution of opium) whose appetite without the previous dose of the drug was completely gone. The opium was to him life, and without his accustomed dose he was utterly miserable and useless. The description of his experiences would surpass in interest the confessions of our two celebrated English opium-eaters—De Quincey and Coleridge. After forming a strong resolution to give it up, and actually reducing the daily dose, he fell back worse than before under the thraldom of the drug, and gave up all hope of extricating himself from the chain by which he was so fast bound. Years previously he spent a vast sum of money and travelled over part of the world under medical restraint and keepers, but all to no purpose. Since writing these lines, I have received a letter from him, in which are these words: "I now write as a last chance to you, to know if you will help me. The fact is, I can't go on any longer. The slavery I

* See Author's Paper on "The Power of the Opium Habit," etc., in the Transactions of the Social Science Congress. Liverpool, 1876.

am in so oppresses me, I must end it or end myself; and do what I will, it is too strong for me by myself. I will go anywhere at once to put myself under your care. If you can help me I think you will." The opium smoker's appetite is never good. He takes to sweetmeats and raw fruits. The continued addiction to the drug causes emaciation and a drying up of the whole man.* I have heard of *one* man, an opium smoker, who was corpulent. It is, however, remarkable how quickly the organs of the body seem to recover their former activity after the habit has been once given up. They do not seem to suffer so much in their minute structure from long addiction to opium as they do from spirits. Little real progress is to be expected in China until this great evil has been overcome and eradicated. The views of certain writers (chiefly in Government service, and who, although acting in entire good faith, cannot help seeing with official eyes) as regards the innocuousness of opium must be taken with great caution, as opposed to the experiences of the people themselves and of many foreigners who have lived among them in the interior for more than a score of years. The whole subject is, however, too great and too important, and involves so many interests, that we dare not venture upon it here, and we hope we shall be excused for the few remarks we have here essayed to make.

Closely connected with foods and the health and welfare of the people are patent medicines. As tobacco and opium have been admitted into works on food and food collections, it may not be out of place to mention here the difference in practice between our own and the Chinese Government in regard to the sale of quack medicines. Although China is the land of empiricism and impudent superstitious charlatanry, no patent medicines are licensed and legalised by affixing a Government stamp. It is found that thereby a certain idea of respectability, genuineness, and efficiency are conveyed to the vulgar and ignorant minds among us.

* See by the writer a Paper on "Opium in Relation to Generation and Population." 'Edinburgh Medical Journal,' 1877.

The name *patent* medicine is itself a lie. What poisons are not sold under many well-known names and popular nostrums? In China, except intimately known to the druggist, no one can by any possibility secure poison of any kind whatever (Chinese druggists do not sell opium —only opium capsules); hence before the advent of opium, and still to some extent, gold leaf and precipitation into wells were the accredited modes of death employed. The "foreign medicine" now does the work more quietly and efficiently, and consigns yearly an enormous number in China to that "bourne from which no traveller returns." The paltry tax received by the richest Government in the world is totally incommensurate with the vast amount of harm and reckless waste of money which is spent on patent medicines, even though the enormous profits derived from gullibility be sometimes devoted to the erection of lunatic asylums, &c.

Resumé, Reflections and Inferences.

In all ages in China and the East the every-day ordinary food of the people has been plain, simple, light, non-stimulating, and cheap. The Orientals are most frugal, making use of substances which would meet with culinary contempt in any other country. A poor man in England would starve on the food which keeps the poor man in China and all his family. There has always been a great variety of possible foods and accompanying condiments and relishes drawn from the animal and vegetable kingdoms; in fact, hardly anything that lives and grows that has not been brought into requisition for food by the Chinese. Divine Providence has filled the earth, sea, and air with things which man can eat. They have a very rich variety of foods drawn from land and water which are unknown in the West. The plan of intermingling different kinds of food to form a meal must have been adopted as the result of experience. They have never had any science that could have taught them the correctness and nutritive

value of their dietetic regimen. Fish they have found, all over the Empire, and particularly in the south, when judiciously combined with bread and fatty substances, to constitute an exceedingly wholesome food. For the most part Chinese food has been vegetable and farinaceous, and now and then mixed or alternated with a very small amount of animal food. This is owing partly, no doubt, to the excessive heat of the climate, it being considered unwholesome to eat much meat, and in the country, from the want of ice, the necessity of immediately consuming the whole animal killed, as for example, cow, bullock or buffalo. Meat is eaten for the most part at feasts only, and then mutton, pork, and fowl are in great request. The supposed heating properties of beef and its difficulty of digestion cause it to be eschewed at all times by the better classes. It is only to be obtained when the animal from age is incapacitated for further agricultural purposes, or dies of disease, or is killed owing to some accident, and then the country people, hearing of the rarity, congregate at the spot, like vultures over a carcase, and carry away large pieces. It is cheaper than mutton and pork. The latter is the most highly prized of animal food by the Chinese. The Mohammedans, of whom there are large numbers in the north, north-west, and south-west, confine themselves exclusively to mutton. Calves and the young of all animals are, as a rule, never killed for food, although often for their skins. So much so is rice and flour considered the basis of the meal, that meat is looked upon and spoken of as *t'sai*, vegetable or food adjunct. The meals in general are confined to two daily, and partaken of at seasonable hours—the breakfast about 10 o'clock in the forenoon, and the dinner about 5 o'clock in the afternoon. They have of course tea in the morning early. Immediately after meals the mouth is rinsed with hot water, and the hands and face wiped with a napkin, dipped in hot water. Every person, man and woman, can cook, and cook well and inexpensively, although the proper business of cooking in the family by right devolves upon and belongs to women.

They all know how to boil rice, which, though apparently easy of accomplishment, does not seem to be known in Europe, a plan by which every particular grain stands dry and separate from its neighbour. The style of cooking, the fire used, and the utensils employed are all of the simplest and cheapest description. Steaming bread is preferred as a rule to baking it. Dairy produce is unknown, and its want is unfelt.

Although in the nitrogenous or flesh-forming food of the Chinese the albumen is not derived, as with us, from the white of eggs, which are eaten rather sparingly by the common people, nor the fibrine from the blood and muscle of animals, nor the casein from milk (in which three-fourths of the nitrogenous matter are casein), they find these three proteids or albuminoids largely in the food which they consume, albumen being the common ingredient in the vegetable juices and seeds ; fibrine also occurring in vegetables, and casein in peas and other pulse, the so-called legumen found in these being either identical with or nearly related to casein. When it is said, therefore, that the Chinese do not drink milk or eat butter and cheese, it must never be forgotten that its place is richly and cheaply supplied by the legumes which they eat, and still more by that valuable casein substance, bean curd, which is most extensively consumed all over the Empire. The country being given up so entirely to cultivation, and no pasture land being possible, by reason of the poverty and density of the people, and the necessity for bringing every patch of land under cultivation for the production of the cereals, cows or water buffaloes are used only for agricultural purposes, consequently bean curd has come to take the place of milk and cheese. Moreover, vegetable casein is said to be more easily and quickly digested than when of animal origin. Animal food is generally richer in albuminoid constituents than vegetable food. Cheese, which is twice as rich in nitrogenous matters (*i.e.* flesh-formers) as butchers' meat, may be and constantly is employed with bread as a complete diet. The phrase "bread and cheese," used to

indicate the whole nourishment of man, aptly describes the dietetic value set upon these two articles by our ancestors and the needs of the human system, which these two great substances so fitly and adequately supply. If we compare the Chinese dietary we shall find that the Chinese out of their vegetable produce (*e.g.* beans) obtain a dietary very much cheaper, and not a whit inferior in the amount of nitrogenous or flesh-forming substances it contains, as the Westerns who consume high-priced meat, and do as much bodily work. The Chinese use a larger quantity of oil than of starch, and this is also economical, for 1 oz. of fat or oil will go nearly as far as 2½ oz. of starch. By varying their food morning and evening (for as a rule they consume two meals only daily) a portion of fat in their rations in the evening is replaced by its equivalent quantity of starch and sugar in the morning and *vice versâ*. The wheaten flour they consume chiefly supplies the starch and a considerable quantity of albuminoid substance; the beans and bean curd give the fat and albuminoids; the pork, also so extensively eaten, furnishes the fat; the vegetables give further supplies of these food compounds or else the mineral matter or salts which are required, and the fish, so plentifully consumed in the south, provides the highly nitrogenous food which is invariably eaten with rice, a food rich in starch.

Climate, race, and the situation on the earth's surface largely determine the food of a nation. In the north, animal; in the south, vegetable; and in the temperate zones, mixed feeders obtain. Man can adapt himself to his environments and can become an animal, vegetable, or mixed feeder. Either food gives the necessary energy or power of work required for the discharge of all the duties of life. The required combination of nitrogenous and non-nitrogenous foods can be derived from animals alone, from vegetables alone, or from animals and vegetables combined The following is the proportion of the different food elements: nitrogenous, 1; fats, 6; starches and sugars, 3. Excess of the nitrogenous tends to induce diseases of an

inflammatory and gouty nature, and likewise leads to fatty degeneration of the tissues. This is the prevailing type of well-fed Europeans. A lack of the nitrogenous leads to weakness, want of muscular power, and general prostration. This is the type of the badly fed poor of our large cities. In the East neither type exists, for the food of the people, whether Arab, Indian, or Chinese, comprises both sorts, nitrogenous and non-nitrogenous, in the most remarkable degree. The nitrogenous embraces albumen, gluten, gelatine, legumen, and casein. These are the flesh-formers. The non-nitrogenous are—1, starches and sugars (amyloids); 2, fat and oils; 3, minerals; 4, water. These constitute the heat-givers. In the process of digestion they are reduced nearly to a similar condition, and therefore can replace each other. Vegetable foods supply enough nourishment for our bodies at a quarter of the cost of animal foods. With a vegetarian diet, it is even said, ten men can live where one flesh-eater would starve. Increase the demand for vegetables, the supply increases and the prices fall; increase the demand for animal products, and the supply diminishes, while the price is enhanced. In this view of the wants of the human body it is remarkable that the necessaries of life are cheap and wholesome, while the luxuries are dear and tend to the development of disease. Food reform must begin with the upper classes. Much of the flesh-eating propensities of the poor have been derived from their experience as servants with the richer class, and thus the belief is engendered that flesh is absolutely necessary, and cannot be replaced by farinaceous and vegetable diet. The interests and experience of our people are certainly against such a change of food. At the same time all will admit that there is at the present day too great a tendency to over-eating, meat breakfasts, meat tiffins, and meat dinners. This cannot be a healthy system of diet. Meals would become better and less monotonous by exchanging much of the meat for vegetables. The great staple of Oriental peoples, rice, employed with us for children, could be wisely extended to children of a larger

growth. If we do not imitate the Chinese and Hindoos, we might at least follow the Italian in his meals of nourishing maccaroni. Chestnuts, so seldom seen in England, should be more largely eaten. The adoption of such a diet would save a vast amount of medicine. The Mohammedans in China, owing to their animal food, partake constantly of rhubarb, and so also do the Mongols, and the Chinese grow this drug for these and other flesh-eating peoples.

The Chinese food is cut small in the kitchen and so served up, by reason of the want of knives, forks, and spoons. Chopsticks (nimble fellows) are the only instruments of dietetic warfare which they wage, and this they do worthy of their name, picking up a granule of rice or an oily bean with the greatest ease, an operation which defies the foreigner who has not assiduously cultivated the use of these instruments. Things are so arranged in China that as a rule everything is to be had at the door. In addition there are itinerant kitchens and food vendors where a Chinese meal is cooked and eaten on the street. Hot soup of sheep's entrails, bean curd, vermicelli or roasted pork sausages, meat and vegetable puddings or dumplings, in summer a vermicelli of foreign starch with vinegar, ice, and fruit preserves, or *lau* or rice congè with vinegar and ice; hot sweet potatoes, boiled Indian corn, &c., can be obtained almost anywhere on the streets at the most trifling cost. Others exist where you can have a slice of mutton or pork, cooked, and eaten with bread. All sorts of cakes, fine and coarse, bread leavened and unleavened, are also to be had on the streets and in the shops. Most of these itinerant kitchens provide plates, chopsticks and a small stool. Sitting accommodation is frequently provided by pushing the pole with which the utensils are carried through two small stools. Squatting is the most common position assumed by the Chinese at meals. The mode in which these street kitchens or other goods are carried by the people would baffle a European. The weights are hung at the two ends of the pole and the bearer in the

middle. When the weight cannot be divided, the goods occupy the middle and bearers at the two ends of the pole. With a smaller weight the first position is adopted, a counter-balancing weight being placed at the other end of the pole. The Chinese never carry on their head. Their shoulders are often swollen, ulcerated and greatly indurated on this account. In carrying the heaviest pieces of furniture the weight rests on a small bar of wood placed across the shoulders and on the occciput. It is to be regretted that the spirit of gambling is carried on in the sale of food, fruits, cakes, and sweetmeats, on the street. The vendor carries about him a bamboo tube with thirty-two bamboo slips, marked like dominoes. Others carry on their trade by means of a bowl and dice, and without gambling I am informed that they could not carry on their trade. The rattling of the rods in the bamboo tube is the mode of advertising their trade. This encouragement to a gambling spirit, already too strongly developed in the Chinese character, is much to be regretted. The practice obtains all over China. The cooking in the house is economically carried on in the north over a fire which in winter is used not alone for cooking but also for heating the house and bed platform at the same time, the warm air passing in flues under the bed. In summer this fire is placed outside, and has a kettle of water always simmering by it with which to make the ever-ready tea.

Restaurants are to be found everywhere in China. In the large cities these exist on a large scale, and are the rendezvous of the higher classes where friends are invited to dinner. The Chinese family relations prevent as a rule social gatherings at their own homes. It is considered highly becoming to invite to one of these dining-halls. When dinner is desired to be served at home or a dinner is presented to a friend, the meat dishes are sent out in pewter vessels ready cooked, and require only to be warmed with a little spirit, which, placed in a lamp, is affixed to each. At the restaurant itself dishes are thus brought upon the table, so that they remain constantly warm. Instead of

invitations to dinner, or the present of dinners, it is also not unusual to give a card for a dinner to be eaten in the restaurant or sent home.

So much for their food. The Chinese never drink cold water or any water or other liquid at their meals. They begin and conclude with tea at feasts of ceremony. The national beverage is tea, in summer cool tea or acidulated iced rice water, or hot water. No cold unboiled water is used; sometimes, however, cold boiled water is drunk. One of the most common expressions is *pai k'ai shui*, white (plain) boiled water, used for drinking or in swallowing medicines. In China there are two sorts of intoxicating liquors, a coarse spirit distilled from millet, and a yellow wine fermented from rice. The latter is only mildly intoxicating, the former strongly so. Intoxication hardly can be said to exist. At all events it is but rarely seen. In twenty years I cannot say I could not reckon them all up on the fingers of one hand. The spirits and wine are drunk out of very tiny cups, the latter invariably hot; the former by the middle and lower classes, the latter by the upper classes. The people are temperate in all things, and in nothing more than their drinks. Wine and spirit licenses are not required to check or regulate the consumption. A patriarchal Government like that of China leaves this, like many other things, to the sense of propriety in its own people. Tea is never taken as a meal, it forms no part of the repast proper. It is the invariable substitute for cold water, and is drunk very weak, and therefore not at all stimulating.

At present a wholesome activity exists in regard to national health. The Health Exhibition is at once its expression and its earnest for the future. The agitation has been waged chiefly round the question of housing the poor and disposal of sewage—two by no means unimportant factors in the question. Food and dress have had less attention paid to them than perhaps their importance demands. Improvements along the whole line of health and hygiene are necessary, but the food and drink question seems to lie very much at the basis of the others. There is

nothing more false than the popular theory that ameliorated outward condition is the panacea for the evils of society, although at the same time we must admit that vice leads to poverty and that poverty leads to vice. Health is the harmonious working of all the organs composing the body, to which pure air and water and nutritious food are all necessities. Numerous diseases are traceable to lack of necessary food and over-indulgence in special kinds of nourishment. There is an under and over nutrition. The proverb "Enough is as good as a feast" is only half a truth. Enough is far better than a feast if a "feast" means more than enough. Over-feeding is more dangerous than under-feeding. Intemperance in eating is one of the most fruitful of all causes of disease and death. In Europe there is much eating to gratify the mere palate, hence the great variety of dishes. The over-fed get rheumatism, fever, gout, inflammation, forms of disorders which superfluous food so often produces. The life of labour and short commons has upon the whole a much larger share of happiness than the life of laziness and luxury. Much of the cooking of the West, at least of the so-called luxuries of cooking (Frenchified cooking), are merely devices to make people eat more who have already eaten enough to satisfy the appetite. Thrice favoured is he who is not daily exposed to the dangers of a luxurious table.

As illustrating the principles sought to be inculcated in these pages in regard to food, I make no apology for referring to an article on Cheyne, styled the father of modern dietetics (born 1671 in Scotland), from a late number of the *Medical Times* (Jan. 3, 1885, p. 32), who was addicted at an early period of life to somewhat riotous living and Gargantuan feasts, grew corpulent, unwieldy, lethargic, and melancholy. A course of Bath waters relieved him, and during two years, in which he adopted a diet of milk and vegetables, he mended still more, but on resuming ordinary diet he again became extremely fat, weighing at one time thirty-two stone. He was next seized with erysipelas and gout, but on resuming his milk diet for four years he

again recovered, and after this he enjoyed twenty years of health. He says: "When mankind were simple, plain, frugal, and honest, there were few or no nervous diseases. Temperance, exercise, labour, and industry kept the juices sweet and the solids braced. . . . Most of the disorders happen to the rich, lazy, and well-protected, and hence must be due to something entering the body. The extreme prevalence of these ailments (one-third of the complaints of the well-to-do) in our country is due to the moist air, variable weather, rank fertile soil, rich and heavy food, the wealth, inactivity, and sedentary occupation of the inhabitants, and their habit of living in large towns." He traced nervous weakness to bodily derangement, and prescribed evacuants and abstemiousness as the appropriate treatment. The Father of Medicine and the ancient physicians held similar views as to the importance of regulating the diet in the cure of most diseases. Patients then, as now, however, disliked the disagreeable restraints of such a cure and preferred to hope for miraculous elixirs promised by the alchemists. Of a celebrated physician it is said, I think, that he would rather die than follow his own prescriptions of temperance in diet. The text of Cheyne's writings was temperance.

An English lady of rank has lately presented in one of the Reviews a startling but apparently true impeachment of the luxury of the present day, with its succession of meals from morning to evening. The same extravagance that reigns with regard to food also reigns with regard to dressing, and she might have added also with regard to house furnishing and everything relating to living. *Punch* of the day takes off well the same extravagance of high living and low thinking. Through ignorance or neglect of health science, thousands are sent to an early grave. People seem reluctant to believe what cannot be gainsaid, and which the experience of China amply corroborates, that the vast majority of disease is preventible. Acute disease of the various viscera of the body, including heart, lungs, liver, kidneys, brain, spinal cord, are altogether unknown in

China. Imagine in 1872 alone, 120,000 deaths preventible in England and Wales! One-sixth of all the cases of insanity, in the same countries, are due to dissipation and depraved habits, intemperance and drink. The pace of modern life is rapidly filling our asylums. One of the very greatest evils, if not the greatest evil of the West, is the tendency to take alcoholic drinks to alleviate sorrow and depression of the nervous system. Drink is a great incentive to crime and the great producer of illness. Drunkenness is said, on the highest authority, to be the source of nearly all the crime in the army. If intoxicating drink were avoided, there would be infinitely less temptation to crime. It will be well for the country when we shall be able to say, "Britons never shall be slaves"—to drink. It is, I suppose, the foggy, cold, chilly atmosphere of our country and Northern Europe generally which compels, or at least invites, the use of alcohol, and leads to that drunkenness which Chaucer terms "that horrible sepulture of mannes reson."

The condition of our people depends upon their food more than anything else. Insufficient nourishment causes physical degeneracy and a craving for stimulants, which lies at the root of much of the drunkenness of the present day.

The food which is too often supplied to the poor is inferior in quality and deficient in quantity; putrid meat and fish and adulterated articles abound. In China there are no authorities to take supervision of these things and destroy improper food. The people are themselves most frequently the best inspectors; they are shrewd and will not take what is bad. The prevalence of and general addiction to vegetable and farinaceous diet renders the people independent of the dear and readily decomposing animal food.

We ought to be better fed, better clothed, and better lodged for the money. We cannot but express our decided convictions in regard to these matters. Goethe has said "Es darf der Freund nicht schonen." Food reform is

therefore of all scientific questions the most important. We have to fight against the power of custom and habit, traditional prejudice and educational bias. This reform must spread downward. We eat to live rather than live to eat. Our flesh diet ought to give place more largely to farinaceous, vegetable and fish diet, and it would be found that our health, strength, and happiness would be correspondingly improved. Simplicity in diet must be the food reformer's object, and after that the plainest dishes would be the most enjoyed. Not only is this to be highly recommended on its own account as conducive to a healthy body and mind, but it seems a necessity, for at the present day the wages of large classes are insufficient to meet the conditions of modern civilization. The tendency of the present day is towards complexity of food and increased number of dishes, when one course would have been sufficient for our ancestors. As a nation we could afford, with decided advantage to the national health, to consume much more fruit and vegetables than we do at present, if we could obtain them at a moderate price. Not only could we, and ought we, to import more fruit from the United States in the refrigerated chambers of our magnificent Atlantic steamers, but we ought to grow a great deal more for ourselves. We are told that fruit may be preserved for many months in a fresh condition, by being washed, dried, moistened with brandy and then placed in very fine sand sufficiently thick to cover it. The unremunerative character of many of our old branches of agriculture will oblige us to modify our dietary and grow fruit on a large scale, and more in accordance with the programme which nature yearly patiently unfolds before our eyes. A distinguished statesman has pointed out the capacity there is in the country for jam-making, more of which could and ought to be consumed. We shall not suffer in mind, body, or estate, though the status of the national roast beef should be jeopardised. Some one has said that they were wise and genial human sprites who found their recreation *inter poma, lac et vinum.* We ought

to assimilate our mode of living more to the vegetarian dietary than is usually practised. Animal and vegetable food contain nearly the same elements. A good day's work has been done on a slice of bread and half a dozen bunches of grapes. It is an eminent London physician, I believe, who finds in raisins all the stimulant needed after an exhausting day's work. Salads should be on the table every day in summer. Luncheon, or tiffin as it is called in the East, should consist of fruits and salads, and should form the staple of the *menu*. In the East, among Europeans, the tiffin is a most substantial dinner with beer and wines. Fruits with cream or milk is a very pleasant way of getting an easily assimilated nourishment. The experience of China through a long course of ages may be useful to Western philanthropists and sanitarians at the present time, and the important lessons which the Chinese—the most vital and persistent of people—inculcate upon us in matters relating to food, are well worth our attentive consideration.

We do not argue for the adoption of a purely vegetarian diet; the Chinese are not vegetarians. They consume a considerable quantity of animal food, fish in the south, mutton in the extreme north, and pork and fowl everywhere. In Mongolia the food is almost completely animal—the occupation of the people being pastoral and not agricultural. Their life is active and out-of-doors, and the weather is cold and bracing. At the same time they are much more subject to rheumatism than the Chinese. This may be owing partly to their highly nitrogenous diet, but partly also to the draughty nature of their tents. In the colder countries of the world animal food will continue to be consumed. What we do, however, strongly argue for is a great diminution in the amount of flesh, which is consumed by us, and a large addition of farinaceous and vegetable substances to our diet. We nearly all eat much more butchers' meat than is good for our health. In the absence of a correct knowledge of the nutritive value and chemical constituents of the vegetable food required by

the various tissues of our bodies, our poorer people are often insufficiently fed. Such people, living, as they too often do, on tea and bread, would be much benefited by an animal diet; those who eat a little would be improved by eating more. The craving for drink would also be greatly moderated, if not removed. By reason of our habits, animal food is at present, although much dearer, perhaps everywhere more accessible and better understood than vegetable diet. But this fact should not be lost sight of, that food from the two kingdoms is almost identical, and what benefit we derive from the one we can secure by proper combination from the other at a great reduction of cost. There is a lamentable ignorance among our people about the right sort of food which provides the largest and necessary amount of nourishment for the body. Chaucer has well said: "Thurgh the gret abundance of his mete, the humours in his body ben distempered." Dante mentions Ciacco (hog), the greatest gourmand and grossest feeder of any country, among those trencher flies of the table who have their punishment in the murk and the mire and the "rain eternal, maledict and cold and heavy," and are barked at and bitten by a dog in the yard of the Inferno. According to the Buddhist faith, gluttons are punished in the next world by being born with capacious stomachs but with a very narrow œsophagus, through which they are never able to satisfy their wants. Taste and a sense of duty alike point to simplicity of life, abstaining from intoxicating beverages, narcotics, and undue addiction to animal food, alike on grounds of health as on account of their high price and expensiveness. All consumption of luxuries may be said to be unproductive. It creates, as one has said, a temporary employment while it destroys the capital, which, if saved, would have been a permanent addition to the wage fund. If a steady temperate man wishes to rise in any trade he is almost sure to benefit his position. It is a sad mistake to believe, as has been asserted lately, that our working classes are the most thrifty people under the sun.

The Chinese carry off the palm for thrift, industry, temperance and simplicity of life.

Chinese Dinner of Ceremony.

The Chinese official dinner, or dinner of ceremony, is of an elaborate description, consisting of a variety of dishes. The most remarkable thing about the dinner to a foreign observer is that the dessert begins and the substantials end it, the reverse of what obtains in the West. This arrangement has more philosophy in it than is at first apparent. Fruit at dinner in the West is almost invariably offered at the wrong time. The most unphysiological and undesirable time for attempting the digestion of raw fruit is at the end of a substantial meal, and it is not the digestive powers only which would benefit by a reversal of our customs in this respect. Tea is always offered in the ante-room before and after dinner. The table is bare, chopsticks of ivory and wood, or wood tipped with ivory or silver, take the place of knives and forks. The meat is for the most part already cut into small pieces to suit the chopsticks, or, as in the case of fish and duck, is easily broken down by their aid. One or two small saucers are provided for each guest, which are changed as occasion requires. One or two small slips of paper are provided as napkins. Each guest has his servant who waits upon him, not as with us in handing round dishes, or assisting the guests to partake of the viands, but to pour out the hot *Shao hsing* wine into tiny cups which require frequent replenishing. Should the wine have become cold before being drunk, it is returned to the kettle, and the glass refilled with the hot liquid. The wine is heated by being placed in boiling water. On first acquaintance with it, it is not much relished. The host calls upon the guests to drink. A system of drinking by forfeits is much in vogue, wherein certain numbers are called out and indicated on the fingers, agreement or disagreement as the case may be, being followed by the punishment of drinking off the glass of wine. The servant

furnishes his master with a large coloured napkin, which is attached to the upper button of the robe, and is intended to protect the dress, a very necessary procedure. The servant is also ready at the conclusion of the meal to take charge of the napkin, and furnish his master with a soft cotton napkin wrung out of hot water, with which the hands and face are wiped, and also a vessel filled with warm water with which to rinse the mouth. At table the placing of the guests is scrupulously attended to. At the commencement of the meal the host assists his guests, or calls upon them to assist themselves. The order of the dishes on the table of each course, and the order with which they are introduced, are all according to well-defined ceremonial, and to be found in works on the subject. Some of the courses have, others have not, a regular order. It is to be observed that the dishes of both dessert and dinner are, of course, varied according as the different things are in season, and also that some of the dishes may be varied according to choice. In the subjoined table the most approved order has been followed. The dessert dishes precede the dinner proper very much after the fashion of the Russian caviare. Among these are found a large variety of fruits, fresh and preserved, and such other articles besides those mentioned in the table, as apples, walnuts, melon-seeds, small delicacies of fish, fowl, and pork, roots of the reed, &c. The remains of the dessert are left round the sides of the table, to be partaken of throughout the meal or during the intervals of the courses. The Chinese dessert coming at the beginning of the repast permits of much healthy, fresh, and vigorous conversation, a closer acquaintance with the guests, and opportunities for the host to entertain. After dessert the more substantials of the dinner are brought in, and placed in regular position on the table. Among these the following should be singled out as very enjoyable to the European, viz., the fruit soup containing lotus-seeds, pearl barley, &c., the dish of bamboo sprouts, the apricot tea, the sharks' fins' soup with small pieces of pork (the fins taste more

gelatinous than cartilaginous), the roast duck, boiled fish, roast pheasant with flour cakes and soy, and the concluding dishes of rice in various forms, sweetened and with fruit jams. The culinary art has been brought to great perfection, and the rich variety of palatable and nourishing food from all nature is truly astonishing. The stomach is not loaded with any heavy, tough, or stringy meat, whether of beef or veal. A few cups of wine to one not accustomed to the rich variety is to be recommended. This wine is not at all so indescribably bad as has been represented. Its poverty in alcohol and absence of rich flavour will never recommend it to Europeans. It is pleasanter, however, hot than cold. Although these remarks may give a faint idea of the Chinese dinner of ceremony, it is to be remembered that in private the meals of the officials on other occasions are like those of the common people, of the simplest description.

ILLUSTRATION OF A CHINESE DINNER OF CEREMONY.

Sixteen Dessert Dishes.

Ham. Hwo-tui.	Crabs cured with samshoo. Hsieh-hai.	Ducks' eggs preserved. Sung-hwa.	Cold roast duck. Shao-ya.
Winter bamboo shoots. T'ung hsuen.	Yellow leek. Chio hwang.	Pickled cucumber. Tsu hwang kwa.	Salted cabbage. Yen pai t'sai.
Preserved dates. Mi chien.	Sugar candy. Ping t'ang.	Preserved orange. Chü ping.	Young egg plant. Tien chieh.
Root of water-lily. Ngäu, or Water chestnuts. Pi chi.	Persimmon. Shïh tse, or Solid jam of a species of red fruit (*Cratægus*). Shan chakau.	Grapes. P'u t'ao.	Pomegranates. Shïh lieu, or Pears. Li.

DINNER PROPER.

1st. Eight Large Bowls.

Birds' nests.	Yen wo.
Sharks' fins.	Ü che.
Beche-de-mer.	Hai shen.
Claws of bear.	Hiung chang.
Sinews of tiger.	Hu chin.
Bream.	Chi ü.
Stewed deer.	Lu fu.
Mushrooms.	Muh kwo.

2nd. Eight Small Bowls.

Pigeons' eggs.	Koh tan.
The yellow of crabs.	Hai hwang.
Lotus-seeds.	Lien tse.
White truffle.	Pai muh erh.
Shrimp sauce.	Hsia jen.
Blood of ducks' head.	Ya hsieh.
Pheasant.	Ye chi.
Mustard leaves.	Chieh lan tsai.

3rd. Four Courses of Roast Meats.

Roast chicken.	Shao chi.
Roast duck.	Shao ya.
Roast young pig.	Shao chu.
Roast goose,	Shao ngo.
or	
Roast mutton.	Shao yang.

4th. Two Courses of Cakes.

Steamed sponge cakes.	Tan kao.
Spring vegetable rolls.	Chun chwan.

DRESS OF THE CHINESE.

"Nature needs not what thou gorgeous wear'st,
Which scarcely keeps thee warm."—*King Lear.*

1. *Dress in relation to materials.*—The materials of clothing, derived from both plants and animals, have, of course, in all countries multiplied with the advance of civilisation. At first the leaves of trees sewn together were likely to have suggested themselves to man in the infancy of his race. In China, at the present day, the coir, fibres of the cocoanut, bamboo leaves, and reeds are made into various articles of dress among the lower classes, and especially among fishermen. In wet weather many of the agriculturists wear a cape of these instead of umbrellas, to protect the head and shoulders, and throw the rain off the body. Hats are made of bamboo and straw, sandals of straw, largely worn by Chinese, Coreans, and Japanese, and summer clothes of grass cloth. Bamboo clothing is made from the finest branches of the tree, worn in summer next the skin to keep the light cotton shirt or inner jacket from irritating the skin when moist from perspiration; sometimes worn without the upper cotton garment over the upper part of the body. The country is rich in various fibres, many of which are little known to European weavers and spinners. The grass cloth made from such fibres is fine and remarkably strong. The fibre could be imported into our own country and worked into cloth. It is preferred to the flimsy foreign goods so generally exported to China. It is cooler, more durable, and, besides, has the advantage of not adhering to the person when warm. This cloth is universally worn in summer. Not only clothes, but paper is manufactured from the mulberry, bamboo, and reed leaves. A strong Corean paper, used for windows in North China, is prepared from the bark of trees. Straw braid, made from a bright yellow straw, and of which there is a large trade in the north, is used in the manufacture of hats,

After leaves and grasses as coverings come the skins of domestic animals, or those killed in the chase for food or pleasure. Skins and furs of all kinds in winter are abundantly used in the north of China for lining garments, and generally as articles of clothing, to an extent altogether unknown in Europe. Peking is the great mart for all sorts of furs, from the rich regions of the Amoor, Manchuria, and Thibet. The advent of Russia in the two former regions has, of course, diverted large quantities of the richest and best furs to European Russia. The climate of North China is so rigorous in winter that all who can afford it wear furs. A man or woman is very poor who is obliged to pass the winter without a sheepskin. The higher classes have their garments lined with more expensive furs. The principal furs to be had at Peking are the sable, fox, wolf, tiger, otter, ermine, squirrel, seal, mole, beaver, sheep, lamb, born and unborn, goat, dog, cat, &c. Those which combine lightness with density of the fur, as, for example, the white fox, are most esteemed for lining long robes. Otter and black fox are among the most expensive of skins. Sable, though less expensive, is highly valued and much used. The Government at the beginning of each winter supplies every soldier and policeman with a coarse sheepskin, which is worn with the fur turned inwards, and without any covering on the outside.

Next to, and along with, furs comes the use of skins denuded of the fur as clothing. The nomads of the Mongolian plateau wear clothes of a kind of chamois leather next the skin. Very imperfectly tanned skins are employed for a multitude of purposes. Leather shoes would be the first necessity. In wet weather leather boots are worn. A layer of leather is often placed along the sole of the shoe. Trunks, in which they preserve their clothes, and for travelling, are made of solid leather. Portfolios, pocket-books, purses, watch- and pen-cases, tobacco pouches, &c., are all made of this material.

After skins comes felt, which is made of the wool and hair of various animals, and manufactured into rugs,

bedding, hats, caps, shoes, socks, stockings, for the lining of boots, and for the covering of tents and other articles of a similar nature. Cows', goats', horses', and camels' hair and wool are extensively used in the preparation of these articles of dress and household use. A fabric is now manufactured from camels' wool from Mongolia, where the Bactrian camel abounds, which a few years ago was utterly useless for anything, save in the preparations of felt, on account of the absence in Europe of proper machinery for separating the wool from the hair of the fleece. A large trade is now carried on in this article from the port of Tientsin.

Woollen cloth would naturally fall next to be considered as the next step in advance of felt and in the order of civilisation. Woollen clothing has never been manufactured in China. The absence of pasture land, and therefore of sheep, has prevented the adoption, and consequently the manufacture of woollen clothing. In the north furs and felt, and in the south silks, have made the use of woollen goods unfelt. It is now being somewhat largely used, and a native factory for its manufacture was established some years ago in Kansuh. Considerable quantities are imported from Russia, and called *kala*, in imitation of the sound of the first three letters of the word cloth. The difficulty and trouble of protecting it against moths, which swarm in China, and particularly its enhanced price over cotton, will always militate against its extensive use by the common people.

Cotton appears to have been introduced into China ; it is now extensively grown. Large quantities are used in the manufacture of fabrics of this substance. The summer and winter garments of the common people are made entirely of it. In winter their cotton clothes are wadded with cotton wool placed in thin layers between the outer and inner layers which go to make up their garments, and then stitched to keep it in position. The clothes of the people being roomy permit of this addition. It gives, of course, an unnatural size to their persons, but is extremely warm and comfortable, and takes the place of fur among

the better classes. It is always a wonder to them how foreigners can keep warm with such tight and apparently thin clothes as they wear. Clothes of all sorts, bedding, &c., are made of cotton cloth, and padded.

From the foregoing remarks it is evident that in China there is an extensive use, not of wool but of fur, an animal product, just as it covered, protected, kept warm in winter, cool in summer, and averted disease from the animals that wore it, and a still more extensive use of woven fabrics of cotton, a vegetable product, with much of it in a state of nature, which covers, protects, keeps warm in winter and cool in summer, and averts disease. Both these sorts of garments, by reason of their structure or the looseness of their form, serve the purpose admirably of absorbing the perspiration, and allowing it to pass freely away. The Chinese are not much disposed to sensible perspiration (which they rather dread), because of their slow movement and life of dignity and repose. There is, therefore, little danger of its being repressed, as is supposed, by the use of cotton garments, thrown back upon the skin and condensed. I have seen this condition in cholera and other diseases, but never in health. When the Manchus take violent exercise they either strip or use a soft loosely woven cotton cloth, which absorbs the moisture, somewhat like the Turkish bath towel *minus* the nap. The native cottons are coarser and much looser in texture than European stuffs, and have no size. The people use these cloths for rubbing down, and as a rule in summer, in private life, they strip to the waist, and when dressed merely don the thinnest robe of cotton, gauze, or grass cloth. The European constitution, with its inflammatory nature, fed principally on animal food, and taking, if not requiring, active exercise, finds woollen fabrics both comfortable and perhaps essential (although large numbers wear none and yet retain excellent health), in summer and winter, for absorbing, if not for assisting, in the evaporation of the emanations from the skin. The Oriental, with his slow life, lymphatic temperament, and rice diet,

finds comfort in summer in his loose roomy cotton or gauze fabrics. Before the former, by the mere adoption of animal clothing, "can count upon the same immunity from disease as is seen in well-cared-for domestic animals," he must bring his diet and life generally into more accord with theirs. He surely does not dream of borrowing their coat to reap their immunity from disease. The Chinese in their cottons have gained for themselves, by reason of their abstemious diet, quiet habits, and seasonable dress, a geater immunity from, and amenability to treatment of, disease than the flannel and woollen clothed European, and in some respects also than the well-cared-for domestic animals. It is well known that the domesticated animals frequently suffer more than those in the wild state, and at Peking nothing is more common, and to the owners more sad, than the frequent deaths of their over-fed and over-cared-for dogs and cats. Malignant pustule is not an unknown disease among hair, fur, and wool sorters. The Chinese believe the hair of some animals to be poisonous. The Emperor of China is said to sleep between tigers' skins.

Regarding the coolness of woollens in summer and the immunity from diseases which they are supposed to give, and the general question of underclothing, it may be remarked, into what wise arrangement nature has entered regarding the covering of the lower animals, by which the hair, fur, or wool is gradually thinned, shortened, or falls out, or entirely falls off. The process is slow and is adapted to the change of season. To gain all the benefit of such garments nature in all her changes must be closely imitated. Our civilised life has separated us so immensely from the lower creatures that we have lost much of our natural power of endurance and resistance to disease possessed by them, and by our mode of living have induced or inherited weakly constitutions, that it would require more than mere fur and woollen clothing to keep us in perfect health. If we can regulate our clothing and habits, and all other matters relating to health as nature

does hers, it will matter little of what fabrics our clothing is made. Here it is emphatically not what goes out of a man but what enters that defileth. And, moreover, through the experience of many centuries the Chinese have got into the way of healthy living, for after all it is very largely a matter of custom and habit, and we shall not do wrong to imitate them in all their good points.

Silks, satins, crapes, and gauzes form the rich material of the dresses of the wealthy, literary, and official classes. From the black satin skull-cap and the velvet collar, worn by all classes of the Chinese, down to the satin boots, which may be worn by all classes, but which are obligatory on all mandarins when on duty, paying visits of ceremony, &c., the dress of the upper classes may be said to be entirely of the cocoons of the silkworm. Sericulture has always been highly esteemed in China, and so important a product was it in early times, that Western nations seem to have known China as the silk-producing country, and to have called it from this circumstance. The Chinese word for silk, *sz*, seems to enter not only into the name of the country as known to the nations of the West in ancient times, but also into the structure of all words in all languages relating to silk or its preparations.

2. *Dress in relation to climate, comfort, convenience, and prevention of disease.*—The adaptability of the Chinese dress to the season and ever-varying changes of temperature is remarkable. In this respect it is strikingly useful and convenient. Being in several layers, like an onion, it permits of one or more being added to or taken off without destroying the unity and symmetry of the dress, and thus enabling the individual to regulate the heat of the body to the season and the daily alternations of temperature. This ought to be the object of all raiment; dress was never intended simply to cover the body without regard to the vicissitudes of climate, and still less (although desirable in and for itself when the main object has been attained) for the sake of show and appearance. The Chinese have been wonderfully successful in hitting upon

seasonable robes. Their houses have no boarded floors, their streets no causeway or footpaths, and so we find their shoes having thick soles of pressed paper, made from the bamboo, of old cotton cloth, or rags, or of felt, all of which are practically impermeable to damp and cold. The feet are very susceptible to cold. Many grave diseases originate with cold and wet lower extremities. Being farthest from the central organ of the circulation and heat and nervous energy, common sense dictates that the feet ought to meet with more consideration than they do from Europeans. The long flowing robes which are worn by the Chinese, besides being graceful and concealing the less comely parts of the body, keep the thoracic and abdominal viscera and the upper and lower extremities warm in winter; while in summer they allow of loose garments being worn, either alone or underneath, without marring the symmetry of the dress. The variety of layers and the thickness of the material are decided by, and adapted to, variations in temperature. There are unlined silks and gauzes for the wealthy, grass cloth for those lower in the social scale, and the thinnest cotton cloth for the lower classes for summer wear. For use in the spring or early summer, or late summer and early autumn, or the morning and evening of the warm days in such seasons, there are silk clothes of a closer texture for the one class and strong foreign or native cotton cloth for the other. For spring and autumn wear, lined clothes of the same material are employed. Earlier in the spring or later in the fall, or late and early in winter, clothes having a thin central wadding of cotton wool are worn. In the depth of winter all clothing except that next the skin is wadded, the external garments are either sheepskin or costlier furs, covered externally with silk, satin, blue or black cotton. The poor country people have their jackets and trousers heavily wadded with cotton wool, about one pound in each. In the north of China, therefore, there are at least five distinct suits of clothes in use by those who can afford it.

Among the lower classes three suits, a summer, winter, and spring and autumn garb, would meet all the demands of the climate; the difference between the first and last consisting in the absence in the latter of the cotton wadding. The hats, caps, and shoes are also in strict accordance with variations of temperature. In summer straw, in winter felt, are the materials of which the head coverings are made; in summer cloth, in winter velvet shoes lined with cotton wadding form the coverings of the feet. As already remarked, however, the great peculiarity of the Chinese dress, and that which renders it so suitable for climatic variations, is the ease with which the various robes composing the dress can be put on or off, to suit sudden changes in temperature, without destroying the symmetry of the dress. This convenience arises from the fact that the various layers of the dress are alike in style, and therefore addition to or subtraction of one or more does not affect it. This remark applies to both sexes. If this were attempted in the West beyond the great coat in men, and the mantle or cloak in women, the dress would be unpresentable. With us, all changes of temperature must be met by changes in our underclothing, and this is much more difficult and inconvenient to attend to. If it consisted in throwing off or on an upper garment, this could be easily affected, but when it comes to affecting our underclothing, morning noon, and evening, and the frequent alternations of weather, the difficulty is increased manifold. In spring how much illness and the seeds of disease and death are sown by a too early throwing off of our underclothing, and in winter by a too late adoption of warmer clothing? The Chinese dress meets these changes at once with ease and without risk. The long robes and thick soled shoes and boots doubtless interfere with quick movement; but this is of little account when it is considered that rapid locomotion of any kind is thought unbecoming, and all who can afford it prefer to ride in a cart to walking on foot. Excepting this defect, if defect it can be called (for our fast walking,

running, and general hurry is not only unbecoming, but positively injurious and productive of disease), all must admit the gracefulness in shape, colour and material, and the usefulness of the Chinese dress to be superior to our own. In summer, while we are sweltering in our European tight-fitting clothes, the Chinese do not even feel the heat. We perspire enormously, and are obliged to change our garments, sometimes more frequently than once daily, and drink large quantities of iced water (and more frequently injurious alcoholic beverages), whereas the Chinese would think something serious were about to befall them should they be bathed in perspiration. (The Chinese dread perspiration as weakening the body and permitting ingress to deflected or thievish (injurious) air.) Again, at Peking, in the winter, while we are suffering intensely from the cold, the Chinese, without even stoves or grates, are comfortable in their lined furs or wadded garments. We seem to acknowledge the suitableness of long flowing robes in our academic, ecclesiastical, and legal relations. The long sleeves protect at all times the hands. On account of their great length, being out of proportion to the length of the lower limbs, they cannot be considered graceful from the European standpoint. The hands being thus always covered, assume a hot and moist feeling which, but for the Chinese rule of shaking one's own hands, would be intensely disagreeable. The long wide sleeves, besides being a receptacle in which the pocket-handkerchief, fan, &c., are carried, also permit of the hands being inserted into, or clasped together in the sleeves, which gives a great sense of comfort. Without doubt the exposure of the hands and wrists often leads to colds, and in summer we know nothing is so cooling and refreshing as the bathing of the hands and wrists in cold water. The wide sleeves also permit the nose, nay, the greater part of the face, being pushed into the sleeve and thus protected. The hot expired air is also thus utilized by the poor in heating their bodies. These sleeves are also serviceable in hiding away one's olfactory nerves when passing any disagreeable

odours, which at no time are far to seek in a Chinese town. With a similar object the Chinese often insert little plugs of cotton or paper into the nostrils. I have seen coroners at inquests adopt this practice, besides placing themselves to windward of the post-mortem examination. With a similar object, and also to prevent or destroy infection, the Chinese carry various medicinal ingredients, camphor, rhubarb, &c., under their nose, as it were, attached to the upper side button of their jacket. The superstitious Mongols carry images of Buddha round their necks and on their breasts, with a similar object of preventing the approach of calamity and disease.

The people generally seem to carry amulets and charms on their persons, round their necks, sewed or embroidered on their clothes, or they have recourse to charms painted on yellow paper, which are burnt and the ashes drunk in the case of illness, or they are drawn over sores with the view of healing them (see the author's articles on "Healing by Charms" in the 'Chinese Recorder'). These amulets are intended frequently to drive away evil spirits or avert the evil eye, like the Phallus of the Romans. When parents with children pass foreigners on the street, they invariably cover the child's eyes.

The Chinese ladies' dress hangs gracefully from the shoulders. The human figure is quite concealed. There is no tightening at the waist. There is no exposure of the neck, breast, shoulders, and arms. The dress is exceedingly graceful, comfortable, and convenient. It is not considered a mark of beauty to have dependent mammæ, and so we find the Chinese wear a broad band, wadded in cold weather, which encircles the waist and lower part of the chest, and supports, and to some extent, also gently compresses the breasts. This practice has at times some advantages, at other times some disadvantages. The band is useful where support is needed. Cases of cancer of the breasts would seem to occur independent of this, as do also mammary abscesses. The practice in infancy of pressing out any fluid which may be contained in the nipple both

among boys and girls is common, and is, I think, to be deprecated. The object is to prevent sore mammæ in after life.

The men's dress is also becoming and comfortable. The hands, feet, and front of the chest are specially well protected, which cannot be said to be the case in our more changeable, damp, and therefore treacherous climate. The long robes and over-trousers give ample protection to the abdomen and lower extremities—parts left to a great extent exposed and uncared for in our costume. The Chinese never require cholera belts in summer, prophylactic measures adopted by Europeans in the East against diarrhœa and dysentery. Their dress supplies their place. What is perhaps wanted to make the Chinese dress perfect is some woollen jacket for internal wear. Foreign cast-off flannels are much esteemed by the servants of foreigners, who at the ports may frequently be found wearing them. It is said the native washermen not infrequently wear these foreign garments before returning their wash. Our European dress leaves the abdomen, and particularly the liver, kidney, and lungs, greatly exposed, and seems made to invite inflammation and congestion of these organs. And so we find among the Chinese, the result chiefly of diet and dress, the absence of pleurisy, pneumonia, acute bronchitis, liver, kidney, and intestinal affections. When we sit or travel by coach or rail, experience has taught us the value of a rug or great-coat over the knees and round the chest and lumbar region. The great-coat, to be scientific and of real value to us, should form more than it does a constituent part of our dress, and be easily put off and on. It is too often the case that with it we are too warm, without it we are too cold. Double upper dresses, especially coats, not light great-coats, of precisely the same pattern and material, would perhaps meet this want. The long great-coat and surtout are the only becoming, healthy and convenient external garments worn by Europeans from the Chinese point of view. The modern ulster, worn by both sexes, is for length, warmth, and comfort in the right

direction, but it is not generally adopted in the trying springs and autumns of our climate, when protection against the sudden alternations of temperature is most needed. Tight short clothes are an abomination to the Chinese. The absurd idea the Chinese of the north formed of our troops in the last war, that they had no knee-joints, and therefore once on their backs that they could never regain their feet, must have originated from seeing the tight trousers which they wore.

3. *Dress in relation to colour.*—The universal colour among the common people for their cotton fabrics is blue. Their inner garments and their stockings are of white cotton. So are their handkerchiefs, which they invariably carry up their sleeves, and which are used for wiping the face or nose after blowing it with the fingers. (The Japanese use paper for this latter purpose, although both nations agree in the use of paper table napkins.) The mourning colour, whether the fabric be of fur or cotton, is universally white. Grey and blue are secondary mourning colours. The common Coreans wear white cotton as their every-day dress. White, therefore, does not seem to have been the mourning colour in early times. Their dyeing materials for blue and black (and the Chinese word for black may stand for any one of the colours, black, green, blue, or iron grey, or white with the least quantity of iron grey in it, when applied to a horse) are derived from indigo, chestnut, oak, acorn, and the blossoms of the *Sophora Japonica.* Harmony of colours is a striking feature of the Chinese dress. In the dresses of the upper classes a rich variety of colour prevails. Great harmony in the selection and arrangement of colours is shown. The Chinese complexion being invariably the same, jet black hair and yellow physiognomies, no special adaptation of form and colour to the individual as obtains in the West is required. The Chinese garments consist not only in the symmetry of the parts individually, but in the harmony and proportion of each part to the rest. It is here worthy of note how beautifully and fitly dressed, with such

wonderful adaptation to season and habitat, are all God's creatures, whether animals, birds, or insects.

4. *Dress in relation to decoration.*—Decoration and ornamentation naturally follow colour. No people are perhaps more given to decorating their clothes and their persons than the Chinese. Among all classes ornamentation is aimed at and highly appreciated. Among the poor people a flower in the hair, a butterfly on the shoe, a little narrow printed edging round their skirts or openings of their jackets or sleeves, will often suffice. At the present day large quantities of printed cotton stamped from blocks is used for clothing, trimming, pillows, shoes, &c. As we ascend in the social scale we find a corresponding richness and elaborateness of all kinds of embroidery, the work of the skilful Chinese women. Embroidery seems to be an essential part of female education in China. Every part of a woman's dress is highly and tastefully embroidered, particularly the collar of the dress, the breast and side openings, along the bottom of the skirt, and the sleeves and shoes. The silks are themselves most ornamentally wrought with medallions of dragons, butterflies, characters for longevity, &c. Gold and silver thread enters largely into these embroideries. Every part of the dress and the person is honoured by having some distinctive decoration. Upon the head is bestowed an amount of decoration beyond the mere style of putting it up, and consisting of natural and artificial flowers, gold, silver, pearls, jade, glassware, imitation jade, and precious stones. The workmanship and designs are equally pretty, graceful, and elaborate. The hangings of the doors, curtains of the bed, coverlet of the bed, are likewise beautifully embroidered. Here the characters for felicity and posterity largely prevail. Artificial flowers for head ornamentation are exquisite works of art for which Peking and Amoy are justly celebrated. These flowers are made of pith, the so-called rice paper (pith of *Aralia papyrifera*). Pith paper flowers are superior to those made from cotton or muslin. The pith takes the colour better and reproduces the "bloom" of the flower to perfection.

This seems the suitable place to speak of another species of ornamentation resorted to by girls and young women, till middle life is reached or widowhood ensues; I mean the painting of the face, a practice which is so universal in China among the classes just indicated. Much time is in this way spent at the toilette by Chinese ladies. They are not so successful in painting the human face divine as they are at the embroidery of flowers. In the former they have of course to follow conventional ideas of beauty, whereas in the latter they copy nature closely. The three marks of beauty in the female are from the Chinese point of view coral or peach lips, almond-shaped eyes, and dark high eyebrows. These it is sought to obtain by artificial means. The Chinese face has hitherto been so disfigured by the pitting of small-pox, and the natural colour of the skin being a dirty yellow, that painting has almost become a necessity. As observed above, they do not as a rule paint their own faces artistically according to Western ideas, great daubs of rouge being laid upon the centre of the lower lip and the upper eyelids. As a result of the use of these paints, I have observed cases of lead palsy, the so-called dropped wrist and the blue line along the margins of the gums at the junction with the teeth, with, however, the absence of lead colic. In some of the higher classes I have seen a reluctance to give up the painting and take to Epsom salts acidulated with sulphuric acid in order to effect a cure. According to European taste, the painting of the face is excessive, and the coiffure is laden with flowers and ornaments of gold, silver, and jade. The brilliancy of the colouring of the rich silks and satins lends additional lustre to the decoration. The painting of the lips red is unlike the pricking of them and dyeing them blue of the Arab women, although both, doubtless, have the same object, that of being considered handsome. The one chooses the arterial, the other the venous, colour of the blood as the distinctive mark of beauty. It is odd we should glory in the blue, impure, devitalized blood and not in the red, oxygenated, life-giving fluid. The rapid advance of vaccination may tend to render painting the face less necessary. The

palms of the hands and the white lunated portions of the nails of the fingers are also painted. The different estimate in which moles are held by Eastern and Western sisters is perhaps here worthy of remark. The former have recourse to medicines—will endure any pain or give any money to get rid of these dark spots which spoil the complexion. The same holds good of freckles. A large quantity of foreign preparations having this object in view are sold in China, and the trade is increasing. Some Western ladies consider it a mark of beauty, and where it has been denied them employ artificial means to gain the coveted beauty spot. And here in this connection I must not omit to mention another mark of beauty, and that is the long finger nails, which require protectors, at Peking made of silver, richly ornamented, and with hanging chains, to ensure them against injury. The literary classes also strive after long nails, it being an indication of literary tastes and a position in life above the necessity of earning a living by the labour of the hands. The Chinese are very fond of long nails. They sometimes extend to one, two, three or more inches.

The decoration of the official classes consists in their figured silks and satins, peacocks' feathers, sable tails attached to their hats, their rosaries, their extensive fur lining and edging, their girdles with their clasps, to which are attached their embroidered cases for fans, spectacles, money, watch, flint, tobacco pipe and pouch, &c.; the embroidery of the *p'u tse* on the breast and back of their outer robe, their variously coloured buttons indicating their rank, &c., &c.

5. *Dress in relation to form.*—Length of garments is the first thing that is remarked about the Chinese dress. They are clothed with long flowing garments down to the feet. No part of the body except the face is exposed. They look upon nude figures, whether they be paintings or statuary, as barbarous. Our full-dress costume at balls, with bare arms, breasts, foolishly long trains sweeping floors with the richest materials which would be better

employed in clothing the nude portions of the wearer's body, or giving more space to those cruelly contracted parts, has been held up to ridicule by the Chinese on their return from Europe, and unfavourable comparisons drawn between Europe and Cathay, to the detriment of the former. The Chinese dress covers the hands and just reaches to the foot without touching the ground. It exposes no part of the body to the vulgar gaze. It is so with men, women, and children in China. Contrast this with the exposure of children's arms, legs, and necks in winter. Their power of generating heat is not great, and they cannot take exercise when they feel chilly. How blue many of them look in their perambulators!

After length, the *looseness* of the Chinese dress is perhaps its next characteristic, concealing the figure and form of the body. Chinese garments are adapted to every movement of the body, and do not interfere with its development. There are fewer cripples in China than in Europe. The Chinese are wonderfully free from natural physical deformity.

The Western tight-lacing tendency is opposed to good taste and dangerous to health. The looseness of Chinese dress adds to its warmth, for besides the air in the textures themselves, they enclose a large portion of air between the clothes and the body; and moreover, being loose, they permit a certain amount of friction on the skin, which keeps up a healthy stimulation of its surface and the circulation in the cutaneous vessels. The loose furs worn so extensively in winter in the cold north contain a large quantity of air in their bulk, and thus not only bar the passage of heat from the body but absorb and retain what they receive from the body. The Chinese, however, do not argue in this way, their opinion being that clothes are worn to keep out the cold and not to keep in the heat.

Another characteristic of the dress is its *plainness* and *simplicity*. There is little art or tailoring required in making it, so much so that every woman can cut out her own clothes and those required in the family. The women are

the tailors, and in many cases also the weavers in the family. "The women showed the coats and garments which Dorcas made while she was with them." Solomon mentions the making of garments and using the spindle and distaff, and clothing her household in *double* (for so the word scarlet is translated in the margin of our Bible) garments, as some of the properties of a good wife. The male and female costume is very similar and just sufficient to mark the sex.

Combined with this simplicity is *cheapness* and *economy*, in at least the dress of the common people. Here there is no extravagance. The expenditure for dress in Europe arises not so much (although even here there is a great difference between the cotton-wadded garments of the common Chinese and the same class in Europe) from the cost of the material as the price of novelty. The question of the expensiveness of dress is an important subject, and touches a large number of social questions too big to be treated or even touched upon here. The cotton fabrics of the people must necessarily be cheap, as the cloth is produced and manufactured at home in the winter when agricultural work is at a standstill. The tailoring is nearly all done at home. Cotton wadding is not dear. It increases the bulk and warmth of the clothes and the wearer's person, but not his weight. There is practically no change of fashion, and we know in the West that fashion wears out more clothes than the man. The clothes being loose, an exact tight-fitting dress is not wanted, and therefore the cutting out is easy and can be done by any of the female members of the family.

The Chinese dress is also well adapted *to the station in society of the individual and his calling.* In Oriental countries, class distinctions are as a rule rigidly observed and respected. There is far less of hypocrisy with them than with us—appearing to be in dress what we are not. The Western costume permits more of this, because, outside the army and navy, it makes less of distinctions of all sorts. In the East there are minute regulations relating to the official class, and an unwritten understanding which

seems to govern the great body of the people. The exceptions to this healthy law allowed in the case of dress at marriages, funerals, &c., are well understood. Many of the difficulties of the present day regarding dress in the West would be solved if a consistent dress for different ranks of persons could be adopted and adhered to. Public opinion should also restrict the changes of fashion within certain limits. Much of the demand for novelty could be appeased by the endless variety of fabrics, colours, and trimmings, without changing the form, unless to adopt others which reason and common sense point out to be superior to that in use.

This leads us to make a few remarks on *fashion* in China. We are accustomed to think and speak of the conservatism of the Chinese, and to cite the absence of fickle fashion. Everything is so crystallized, and the people so conservative, as to appear to us a nation with their faces always turned to the remote past, sighing for the return of the supposed Augustan age of their country, and whose most common expression is, *chin puh ju ku*, "The Present is not equal to the Past." Although these sentiments imply changes going on, which do not principally refer to dress, yet the Chinese themselves do admit change; but the changes are so infrequent, so small, and so unessential, that even to the observant foreigner they are not recognised, while even the unobservant Chinese can at once detect foreign changes, especially in female attire. The statement, therefore, that no change takes place in fashion, is both true and false at the same time, according as one or other meaning is attached to the word. The minute changes going on in China do not touch the dress as a whole, and they do not receive acknowledgment as inherent and essential changes of fashion. We admit some small change in the make of a cap, the ornamentation of a shoe, difference in the shade of the materials composing the dress, or even the width of a sleeve, but these amount to so little as hardly to be entitled to the name of change, or to compare with the yearly or more frequent fashions of the West. If we glance over a

period of 200 years, the average life of a dynasty in China, we may detect, perhaps, some changes, and particularly between one dynasty and another, but practically, and to all intents and purposes, it may be said that fashions in China are like the laws of the Medes and Persians, which change not. Compare this with the sudden and great changes in the West, infractions of our style of dress among the female portion of society, which the exigencies of our modern civilization and trade, or the whims of dressmakers and tailors, have compelled us to carry out, without regard to health, climate, or comfort. In China the great principles of dress in regard to health, comfort, etiquette, climate, and the eternal fitness of things, never varies. A little more embroidery here or there does not begin to touch the hem of the garment of Chinese dress in the way of change of fashion.

6. *Dress in relation to the mode of wearing it.*—The most striking thing about the Chinese dress in both sexes is that the robes are made to hang gracefully from the shoulder, throwing the weight upon them, and concealing the outlines of the body. In this respect the Chinese dress is exceedingly favourable to public morality. This much cannot unfortunately be said of European costume, which in a number of points is open to very grave objection. The trousers which are worn by both sexes are fastened round the waist, only children's are fastened by the shoulders. Round the waist the men wear a girdle, which serves to tighten the long robes and increase the warmth by preventing the escape of the heat generated in the body, and it secondarily subserves the purpose of forming a large breast pocket into which things are placed, and at the same time affords an attachment for the numerous articles of daily use, and for pockets which the long robes render inconvenient.

The things attached to the girdle are the fans among the official classes. The poor people put theirs sometimes into their sleeves, down their backs, or affix it to the head by means of the queue. All classes use fans in summer. In

Europe they are regarded as a luxury, in China a necessity. The very beggars, destitute of all else, will possess an old fan, which, besides its ordinary uses, is likewise employed to blow up the charcoal embers of their fire-pots. The fan in China is most useful for protecting the shaven and uncovered heads of the people from the rays of the sun. They are also indispensable for cooling purposes. Like albums in the West, they are often used as appropriate receptacles for poetic effusions, ink sketches or coloured paintings. They are extremely useful for hiding the face when it is not desirable to recognize; at the same time, through the ribs of the fan, everything may be seen without being observed. Attached to the belt is a pouch containing flint and cotton, paper or pith prepared with saltpetre, having a steel along the lower edge, with which to strike fire and for lighting tobacco pipes or fires. Foreign matches, of which there is now a huge consumption in China, have largely superseded this primitive mode of producing fire. By the by, the Chinese attribute diphtheria to the phosphorus of the lucifer matches, this disease being said to be unknown in China until their advent. In the country, and in Mongolia, the flint and steel are still carried. The Chinese having no pockets in their clothing, wear pouches attached to their waist belt or buttons. In them they carry tobacco pipes, tobacco, betel-nut, watches of the old-fashioned type with large dial plates, and broad bevelled edges, which are manufactured in Europe and America for Chinese use. Every official carries such a watch in a pouch, with a round embroidered hole, large enough to show the time without being obliged to take it from the girdle. He carries a comb for combing out his moustache, attached to an upper bottom of his robe, and the ladies carry small mirrors and scented embroidered bags with silk tassels from the same quarter. The women wearing no girdles on the outside of their dress, carry their pipes in the tobacco embroidered bags attached to the above button, and their betel-nut, which Chinese of all classes are incessantly chewing, in the wide folds of their sleeves. The officials

carry their calling cards, money pouches, and portfolios in the leggings and their boots, and the common people their money pouches in their girdles, in their breasts, or in their trouser leggings.

The women wear a belt round the breasts both for protection, comfort, and a certain amount also of compression. In Chinese it is called *wei yao* or waist enveloper, and is similar to what the Hebrew women wore, and which the LXX. have translated *fascia pectoralis* (breast-band) and resembling the Latin *strophium.* It is considered a mark of beauty in China to have the breast somewhat flat. The Chinese wear no corsets, and the *wei yao,* consisting as it does merely of a single layer of cotton cloth, exercises no bad effect on the thoracic or abdominal viscera. The trousers, over-trousers, and stockings are brought together by a band at the ankle, which serves the purpose of strengthening, and adds neatness and warmth to the leg, and does not seem to interfere with the return of blood by the veins. Other particulars of the mode of wearing, and the form of the separate garments composing the Chinese dress, will be discussed below. Let it, however, be observed here, that although the Chinese women wear trousers, that over them, in public and among the upper classes, they always wear long robes and skirts, thus concealing the lower extremities, as in the West. The Westerns need not, therefore, quote these Orientals as favouring trousers and the divided skirt. The Chinese ladies' skirts are certainly divided into four parts closely plaited ; but over the division between each two parts hangs a broad piece of embroidered silk or satin, of the same colour as the rest of the skirt, with a black satin border, at the corners of which are butterflies cut out in outline, discovering some bright colour beneath. Although with their narrow skirts the divisions may facilitate walking, sitting, or getting into sedan chairs, there is no approach to a divided skirt in the sense in which this term is usually understood. The divided skirt as advocated at the present day, which is in my opinion neither pretty nor needful, would not meet with approval among the Chinese.

(The term "Celestials" as applied to the people of China is a misnomer.)

We shall complete what we have here to say in relation to dress in general if we add one circumstance which has an important bearing upon health. We have said that the great variation in the seasons demands distinct summer and winter garments. The people have to guard against moths, or thieves, or poor relations, or it may be want of room, or, still worse, poverty; but whatever be the cause, the great body of the Chinese confide the care of the garments, when not in use, to the pawnshop. They lodge their summer clothes there, and take out their winter suit and *vice versâ*. It seems in their circumstances to be the wisest course, even in spite of the attendant expense. At the time of pawning it gives them a little capital, upon which they trade. Pawnshops in China are of the very highest respectability, at least from the native point of view. They are considered the safest banks. A great trade is thus carried on with these pledges, and they therefore form an important part of the life of the people. I have observed that the outbreak of small-pox at Peking takes place annually at the period when the winter clothes are taken out of pawn. The germs of the disease seem to have been lying dormant in the clothes all summer, and break out afresh in the autumn, just at the time when, by the superstitious notions of the people, grafted on that Heaven-sent prophylactic against the "Heavenly Flowers" —the Jennerian discovery—vaccination is not practised. How fortunate it is that the Chinese have taken so kindly to vaccination. When the great Oriental peoples have become fully protected, there may be some hope of exterminating this dreadful scourge. Except for this beneficent discovery, no European community could hold India or live in China. The Chinese began to vaccinate in the early years of the century at Canton, and now the practice has extended over the whole Empire. I cannot learn that inoculation is now anywhere practised, and an application for *bonâ fide* inoculation virus could not be obtained.

(For history of small-pox and vaccination in China, see Peking Hospital Reports.) Other diseases, it is feared, are propagated and made endemic through this custom of pledging their garments. And again, among the poorest people, the garments worn during the day become the coverlets at night. We have references in the Bible in several places to this same custom among the Hebrews. Both the pledging of the garments and their use at night are referred to in Exodus xxii. 27, and the covering alone in Ruth iii. 9, Ezekiel xvi. 8. The Chinese cannot be said to have any underclothing, except the inner garments be so considered; and these, as a rule, are not often changed. Among the poor people, when the clothes are on duty day and night, a greater attention to cleanliness is desirable.

7. *Dress in relation to disease.*—After twenty years' experience and practice among the Chinese I can safely assert that I have found no diseases resulting from errors in clothing except such as were dependent upon incorrect and superstitious notions of the people, and which ought not to be attributed to wrong principles of dress. The Chinese believe diarrhœa and bronchitis, for example, to be owing to "fire" or inflammation, and, therefore, the natural way to combat this inflammation is to put on less clothing; and so we find in summer the disposition towards this "fire" in the system sought to be averted by carrying the children about naked, nay even fanning them, when the more rational plan would have been to put on clothes to disperse the internal heat, bring it to the surface, and keep it there. Large numbers of delicate young children, therefore, die of summer diarrhœa caused in this way. The universal employment of native mid-wives causes also a large mortality among women and children in countries like China and India. The great causes of infant mortality in the West, as elsewhere, are the health and life conditions of the parents, insanitary conditions of dwellings, improper feeding, &c. In summer male and female children of tender years run about the streets and at home quite

naked, the latter having a mere bib or pinafore in front. The weather is so warm, and the skin gets so accustomed to the exposure, that healthy children do not seem to suffer much, if anything, from this exposure and these *solaria* or sun baths. In summer the upper and exposed portion of the body of the common people gets deeply tanned with the sun, and the beggars, who also go about naked with a heavy patched garment, more variegated than even Joseph's coat of many colours, serving for raiment by day and a coverlet by night, and sometimes with little more than the conventional fig-leaf, do not seem to feel the intensest cold. Habit, and the covering of dirt with which the skin is so freely begrimed, may have rendered their cuticles less sensitive to atmospheric danger. But to return. The only tight place in the costume, always excepting the small foot, is at the ankle, where the garter binds the trousers and socks together. But even from this tightening I have not seen varicose veins or ulcerous sores result. These affections are found, but they are more the results of constitutional weakness and the trades followed than the effect of binding the leg. In Peking the Shantung water-carriers tie a bandage round the calf of the leg, called *kwo tui*, for support. We have elsewhere spoken of the small foot. If there be the absence of disease arising from the absence of errors of dress, how much might not be written on the healthy character of the Chinese dress? A few remarks have already been made on the supposed immunity from disease obtained by woollen clothing.

Description of the separate Articles of Chinese Dress.

We begin with the *coverings of the head.* Among a large body of the people no hat or cap whatever is worn in summer with which to cover the head. A shade for the face and head when desired is always obtained by means of the indispensable fan, which every Chinaman, down to the street beggars, carries in his hand. The children also go about, or are carried about, without any head-covering

in summer. Although they thus expose themselves to the direct rays of the sun, sunstroke is unknown. Nature intended the hair of the head to be its natural covering and protection; but in China, for the last two hundred years and more, the Manchu custom of shaving the greater part of the head has obtained, leaving only a circular portion on the crown with which to form the queue. Even this exposure does not cause sunstroke. The constant shaving and exposure causes the skull to grow thicker.

Heat apoplexy is a more correct expression for the solar influence which we frequently term sunstroke. Heat apoplexy is indeed more frequently produced in the shade, and on dull, close days, than in the sun; and it can also be brought about by errors of diet and dress in a warm climate. Deaths from sunstroke, properly so called, must be rare, whereas deaths from heat apoplexy among Europeans, soldiers, and sailors in the East are not uncommon. The absence of this malady among the Chinese is striking and suggestive. Among Europeans, besides exposure to great heat, the great part of the blame must be laid at the door of the restlessness of our habits and modes of life, warm and tight unsuitable clothing, and, above all, to the frequency, quantity, and quality of the alcoholic beverages which are drunk in the East, and are so plentifully resorted to in hot weather, with the apparently good object of withstanding the depressing effects of the climate. If heat apoplexy attack such subjects in summer, is it unnatural to suppose that the same régime is prolific of other diseases, less sudden in their nature, such as "liver" aneurism, stomachic and other affections? If this be so, what is to be said of the pith hat and other tropical gear believed to be indispensable? I have found these hats anything but light and loose and affording free ventilation. That they would prove a sufficient protection against *direct sunstroke* I am prepared to believe, but the danger does not lie here. A light straw hat, puggaree, white umbrella, and perhaps a pair of light-tinted spectacles, would give all the protection and comfort necessary; and in conjunction with this, if light, easily

digested food, moderate in amount, in summer chiefly vegetarian, and the avoidance of all ardent spirits and violent exercise were adopted, with a free use of cooling, iced non-intoxicating drinks, no foreigner in my opinion need be afraid of insolation from the rays of the sun, nor of heat apoplexy. The first British Minister to Peking held strong views on the value of the straw hat as compared with the usual pith one, and in vain sought to inculcate them upon every fresh arrival. Not a few British and American missionaries, who live and work in the interior, and who, having donned the Chinese dress, are debarred from wearing foreign headgear, go about with bare heads, or the ordinary Chinese straw hats, without suffering in consequence. The short period during which they have conformed to the native customs cannot have hardened and thickened their skulls. As becomes their profession, they are men of temperance. It is time a rational head-dress and mode of living were adopted by our countrymen in the East.

Straw in summer and felt in winter are the materials out of which the Chinese head-coverings are made. The straw hats are fine, with large flapping brims, which shade the face, neck, and shoulders, and a small headpiece, sufficient to cover the base of the queue, and are retained under the chin by strings. The official straw hat, which has a fixed period for doffing and donning in spring and autumn, is very light and airy. The shape is like a low cone, with a broad base of fine white straw or white silk gauze, stretched upon an open bamboo framework. It is also tied to the head under the chin, and touches the head in a few places where knobs of pith are inserted, thus rendering it exceedingly light and moveable upon the head, with a large and free circulation of air. The only difference between the hats of the officials and their underlings consists in the handsome red silk thread which, fastened to the top, hangs equally all round, down to the edge of the official hat ; those of their servants are made of red wool or hair, and extend beyond the edge. These hats have no brim. In rapid movement on horseback,

these red coverings float behind and produce a pleasing effect.

The winter hat for out-door use, of the common people, is made of felt, and of the officials, of satin, with a brim turned up about three inches, at an angle of about 45°. The red cord or tassel hangs as in the summer hat. The officials have the turned-up brim of the winter hat covered with sable.

The indoor cap of the official, and the out-door cap of the common people, consists of a small satin skull-cap, covering chiefly the unshaven part of the head. The officials frequently wear indoors a variegated cap with a long red silk tassel, resembling those worn by the better class children. A warm white felt cap with ear-laps is worn by the country people, carters, and others much exposed to the weather. It is used also as a nightcap. As regards the comfort and appearance of the hats and caps, and their suitability to the dress, the Chinese have reached a point to which we have not yet attained.

In the following table* will be seen the character of the

Grade.	Button.	Girdle clasp.	Embroidery or P'u tse.	
			Civil.	Military.
1st.	Plain red coral.	Gold and jade, ornamented with rubies.	Stork.	Chi lin unicorn ?
2nd.	Red coral, with two characters, *Shou* (longevity), engraved upon it.	Engraved gold, ornamented with rubies.	Gold pheasant.	Lion.
3rd.	Transparent blue, sapphire.	Worked gold (square).	Wild goose.	Leopard.
4th.	Opaque blue, lapis-lazuli.	Worked gold (round).	Crane.	Tiger.
5th.	Transparent white, crystal.	Plain gold set in silver.	Silver pheasant.	Bear.
6th.	Opaque white.	Mother-of-pearl, set in silver.	Egret.	Tiger cat.
7th.	Plain gilt.	Silver.	Partridge.	Tiger cat.
8th.	Worked gilt.	Transparent horn, set in silver.	Quail.	
9th.	Worked silver.	Opaque horn, set in silver.	Blue jay.	

* I am indebted to the "Chinese Illustrated Catalogue" for this table and for other suggestions scattered through the paper.

nine buttons which adorn both the summer and winter hats of the officials, and indicate the grade of the wearer, as defined by law. The hats of the underlings have, of course, no buttons or knobs. Immediately below the button there is a jadestone holder, into which is fastened the peacock's feather when the official has gained the right to wear it. It will be observed that birds appropriately denote the civil, and animals the military, branches of the services.

The foregoing refers to the male head-dress. As for the women, beyond artificial or natural flowers, gold, silver, and jade ornaments, pins, earpickers, &c., they wear no head-dress. Sometimes in winter they may be seen with a peaked band across the head, over the anterior part, and containing in front frequently a precious stone or pearl, true or false. On the front of the men's skull-caps a pearl or precious stone is also usually stuck. In mourning, the ordinary winter hat is covered with coarse white cotton cloth, and a cash is sewed on to the front of it. In winter, in very cold and windy weather, among both sexes out of doors, although most largely among the *literati*, is worn a hood, usually of red woollen cloth among the men, black cotton wadded among the women, covering the entire head, neck, and shoulders, and only exposing a small portion of the face. The female hood buttons at the top, and leaves usually the coiffure free and exposed; the male hood fastens below the chin. These articles are extremely comfortable. They are put over the skull-cap, and under the upturned felt or satin hat. The sailors' sou'-westerns used against rain are the nearest approach to anything of the sort in the West. In the winter ear-caps of plain or embroidered silk or cotton lined with fur are used. In the north the weather is so cold, especially when it blows from the N.W., which it frequently does, that to prevent frostbite these ear-coverings are necessary. These biting winds in winter, coming as they do from the snow regions of the north, over the deserts of Siberia and Gobi, almost freeze one to death. Many poor Chinese beggars are found dead on the streets almost every night during the severity of the winter season.

Coiffure

Next to head coverings, the coiffure of the Chinese falls to be considered. This subject divides itself into two great divisions, or that regulated by small and large feet. Among the Manchus or large-footed females, who are found at Peking and in the various Mauchu garrisons scattered over the Empire, the following styles of coiffure obtain: the *liang pa rh t'ow*, where the hair is divided into two parts (hence the name) and bound together at the back of the head, and then twisted over a wire frame covered with silk, and through which a flat jade (in summer) and embossed gold or silver gilt (in winter) bar, a foot long by an inch broad, called *pien fang*, is worn. A butterfly of red silk cord, with hanging fringe drooping to the shoulder, is worn on the right side. Bunches of flowers are worn over the forehead. Another form of coiffure worn by Manchu women is called the *kau pa rh t'ow*, or high style, in which the hair assumes the form of double teapot handles. The *cheng chwa chi'rh* style consists of a coil tied with red cord, bound slopingly from top to bottom over a frame, and then crosswise over this knot flowers are worn over the ears, projecting to the temples. This is the ordinary private dress of a Manchu maiden. The *shwang chwa chi'rh* is the double form of the preceding, consisting of a large knot on the forepart of the head at either side, with a butterfly of red silk cord, from which a fringe droops to the shoulder, affixed to the knot on the right side. In the winter a fur cap, frequently of sable, is worn by the wives and daughters of officials, with a border of pearls or precious stones, the hair being drawn up under it. The style called magpie's tail, *hsi chüeh i'rh*, from the form of its arrangement, is worn by females at Peking and Moukden (in Manchuria), by birth Chinese, but who have large feet and conform in most other respects to the Manchu customs. The coiffure is ornamented with flowers, pins, earpicks, &c., bearing pretty ornaments in jewels representing flowers, a dragon, &c. The women as a whole use their chignons as re-

ceptacles for stowing away needles, earpicks, &c. These project on the right side of the head so much as often to endanger the child, which is invariably carried on the right arm. The long magpie's tail frequently comes in the way of things. The illustrated catalogue describes the head-dress *tien tse*, that ordinarily worn by Manchu ladies of rank. It stands up straight from the head above three inches over the forehead, but slopes sharply downwards towards the back of the head, the top being flat. The surface of the walls, so to speak, and of the top are completely hidden beneath a profusion of delicate ornamentation, consisting of flowers, butterflies, &c., in kingfishers' feathers and jewels upon a silver gilt base. At the sides are stuck long pins, bearing long and handsome pendants of pearls.

The coiffure of Chinese maidens is called *chwa chi'rh* or *tao tieh 'rh*, the hair being gathered into a coil at the back of the head, and tied round with red cord; it is then bound into a projecting knot some four inches long, over a gold ornament called *hu lu pien fang*, the remainder of the coil being wound round the knot lengthwise. Flowers are worn over ears and temples. In the *shwang chwa chi'rh*, a Chinese girl's head-dress, the queue is bound round at the top with red cord, and a small knot on the fore part of the head on each side. The Chinese wife's coiffure is that known as *Soochow*, the name of a town near Shanghai, consisting, according to the catalogue, of a tapering projection about eight inches long, formed of two nodes of false hair with a space between them, over which the real hair is dressed and kept in position by ornaments of jade in summer, and of gold or silver at other seasons. At the back of the head is a sort of "chevaux de frise" formed by five pins, supporting small models in different coloured stones of a melon, a reversed stirrup, a halbert, a hand and pole-axe, with bunches of flowers over the ears. The *i wan t'ow* is the chignon worn by Chinese with jade ornaments and flowers. In the *p'ing san t'ao* the hair, according to the catalogue, in a coil is dressed into a curved projection

nearly two feet in length, formed by two frames of false hair, over a foot apart, which are kept in position by coils of red and green cord : on this are worn ornaments in the shape of flowers or butterflies, in kingfisher's feathers upon a gold or silver base ; flowers at the sides of the head. The head-dress *feng-kuan* (catalogue, p. 31) in shape resembles a crown or helmet, the body being silver gilt, and covered with rich ornamentation and propitious phrases wrought in kingfishers' feathers and jewels, and having a fringe of pearls across the forehead down to the eyebrows, and long pendants of the same jewels hanging on either side down to the shoulders. This coiffure is only worn at marriage. The only adult Chinese coiffure that remains to be mentioned is that known as *chwa chi'rh.* The catalogue describes the hair as gathered up in the centre of the pole, and bound round with red cord, and plaited into a queue, and then dressed into a knot like the unplaited hair mentioned above, under a similar designation, of which it is a variety peculiar to a Chinese bride's marriage dress. The knot is kept in position by two curved metal ornaments called *ju i,* meaning *as you like it* (a name also euphemistically given to opium by the Emperor Kien-Lung), usually named a sceptre. The ornaments consist chiefly of characters for happiness in red velvet.

The coiffure of children takes the following forms : the *chui ken'rh,* a small bunch of hair at the nape of the neck ; *shwang pien tse,* a small queue on each side of the head ; the *chwa chi'rh,* a small knot or bow ; *ma tse kai,* the hair being cut short, and *kwo chuan'rh,* a fringe round the back part of the crown of the head. The word *pien tse* is the name for queue.

Infants have the entire head shaven like the Buddhist priests at a month old, and this shaving is kept up more or less for some years, one, two, three or four tufts, or a circular fringe round the crown being allowed to grow. The object of frequent shaving is to strengthen the hair, and fit it in after years for being worn long. The girls are

shaved like the boys till the age of puberty, and the boys for their whole life. The Chinese believe that foreign hair does not turn black because it is not shaved in youth. Would the depth of colour gained by shaving not be equally gained by advancing years? Where shaving of the scalp is resorted to in sickness, the hair often grows of a deeper shade, but this also might occur as the result of the illness itself, setting up changes in the pigment cells. Very early in Chinese life a queue is formed by plaiting the hair, the root of the queue being tied of a red cord, and having a red cord plaited into it at the end. In families who can afford it the girls use red tassels (for the cord used to be lucky and felicitous, and to frighten away evil spirits must be red); the common children have simply the two ends of the red cord hanging down. The women, if not in mourning, always wear red cord in their hair (in mourning and widowhood all head ornaments, red colour, and painting of the face are avoided); the boys change theirs for black silk on the approach of manhood. The style of coiffure in the female is changed usually (but is guided by age, taste, and style of foot) when engagement takes place, which is about the time of puberty, the entire hair without shaving being plaited into a queue. Before marriage the hair is worn over the forehead round, after marriage it is worn square; on the morning after marriage the hair is plucked out of the forehead and squared, and this form is always afterwards retained, and is the mark of a married lady. The operation, which requires to be constantly kept up, is very painful. Ashes are first put upon it, and then the hairs are extracted either by the fingers or by means of a thread, which, held between the mouth and two hands and twisted or crossed, performs a sort of mowing motion by which the hair is removed close to the scalp. This removal of the hair gives to the Chinese a large expanse of forehead which cannot be said to be handsome, and is in direct opposition to the custom at present ruling in the West, where the hair is arranged as fringes, or, to use an American term, bangs, which is

equally at fault in the other extreme. The Chinese seem to like a high forehead. The combing back of the hair in the native dynasties, the shaving in the Manchu dynasty, this custom of extracting the hair of the married women, all tend to show their high appreciation of a large bald forehead; like a sky to a landscape, it lightens up the whole expanse. To the Western ancients the low growth of the hair was a feature of such attraction as to be imitated by skill where it did not occur in nature. At the present day we have come back to much the same standard of form and taste. In the best period of Italian art, the women resembled the Chinese in plucking out their hair to increase the height of the forehead, which, as one remarks, may account for the undue size of this feature in some of Raphael's pieces. Baldness is not common among the Chinese, owing to the constant irritation and consequent increased blood circulation set up by shaving and light fitting caps, or more frequently no head covering at all. Women when they lose their hair, and they seem to do so more than the men, use ink for blackening the bald pate. They also blacken their eyebrows, this being considered one of the marks of beauty. At funerals there is a class of boys who wear black silk fringes all round the head, and which resembles nothing else in China known to me, and may be, like Buddhism, of Indian origin?

Women often take their hair down at night and dress it again in the morning. The men have theirs combed and re-plaited once or twice a week, and shaved once a week. The women apply oil, and a species of bandoline extracted from the seeds (*Fei tsao tse'rh*) of the soap tree, or from wood shavings, which contain a large amount of gluey viscid matter. The large black seeds out of which this slime for their hair is prepared belong to a species of Cæsalpinea, which has not yet been accurately investigated by botanists. *Fei tsao* (soap) is made of coarse animal fat and soda. These soap seeds are used as a substitute for soap. The Buddhist priests and nuns shave the entire scalp during the whole of their lives. The custom of shaving and

wearing a queue was introduced by the present dynasty over two hundred years ago, and is therefore a mark of subjection to a foreign yoke. The origin of this practice among the Manchus is, I suppose, unknown. Certain it is, it was not introduced, as is asserted by Boccaccio of the clergy, out of any remembrance of or reverence for St. Peter, on whom, it is said, it was made by certain evil-minded men as a mark of madness, owing to their failure to comprehend the holy doctrine he preached. Others have maintained the tonsure to be a mark of dignity, hence the *corona* or crown surrounding the head—the whole head, except this circle, being shaven. This form of tonsure is well represented in Chinese and Japanese children, and in the dolls now imported so largely from the far East into Europe. Most people in Europe have come to look upon the queue as characteristic of China, whereas it is a foreign innovation. The style of coiffure of the native dynasties was similar to that now worn by the Coreans and the Tauist priests of China, also by those Japanese who have not adopted the Western mode, viz., the tying of the hair into a knot on the crown of the head and fastening it with a bodkin : the queue is often so fastened at night. The male population seems to have taken to it, and there is no apparent desire to get rid of it, or dissatisfaction with it. It is rather a troublesome and expensive coiffure and it soils the clothes very much. It has on this account necessitated the wearing of a special garment on the outside of their robes as a protection against soiling by the hair It is also not free free from danger. Two cases have come to my knowledge where the queue getting entangled in a cart-wheel (which it is apt to do to any one sitting on the shaft of a cart) and carrying away the entire scalp. In pugilistic encounters the queue is invariably the first object sought, and the parties are satisfied to hold each other down by this instrument until satisfaction is obtained, or a compromise come to by friendly onlookers interfering. To cut off the queue of criminals is a punishment sometimes resorted to. Queues are sold in the streets of the capital.

A few years ago a queue-cutting mania spread all over the empire, by which it was supposed that this capital appendage was supposed to be removed by some invisible power. When the present dynasty ascended the throne of China, and compelled all the males to conform their coiffure to that of their conquerors, it is remarkable that they did not also compel the abandonment of the bandaged foot. The seclusion of the women may have rendered it difficult and unnecessary, and possibly they argued that the crippling of half the nation was rather in their favour than otherwise.

The queue is not without its uses and conveniences. It serves the purpose occasionally of a whip, and of a cord with which to fasten the fan to the forehead as a shade. The fan serves the same purpose to the Chinese as the handkerchief to the Arabs, and the queue as the cord of camel's hair which ties the handkerchief round the head. During work the queue is often in the way, consequently it is the habit to tie it round the head. This mode of wearing it is not considered polite, and hence, on the approach of a superior, the queue is invariably let down. The Chinese are very particular as to the etiquette pertaining to the queue, and the same etiquette ought to be exacted by foreigners of their servants.

Speaking of the queue leads to the remark that, although the hair of the Chinese head is coarse and black, hair does not exist in profusion elsewhere, as would be the case with persons of a similar complexion in Europe. They are, as a race, devoid of whiskers; and even if they could grow a beard, the law prohibits it under forty years of age. At the best it is very sparse. All the rest of the face, including nostrils, eyelids, and ears, are regularly shaven along with the head, so that a newly-shaven Chinaman looks the picture of tidiness, cleanliness, and smartness. Knives are in use for shaving the ear, head, and face, for paring corns and toe-nails; scissors for trimming the cut toe-nails, women's eyebrows and hair, and for cutting the hair in the nostrils. The Mohammedans observe the Chinese custom of shaving the pate and face, but with them the facial hair

is more abundant. The presence of so much hair on a foreigner's face is not admired ; nay, women and children are usually afraid of Europeans on this and other accounts (the evil eye, for example), and for those who have to influence the people for good, it would be well to conform as far as possible to the Chinese custom, and shave all the face but the upper lip. The Chinese tend with great care the sparse growth of the upper lip ; and all day long, among the scholars and officials with leisure, a small comb, which is carried attached to the upper breast button, is diligently plied in cultivating this hirsute appendage. A small mirror is also carried with which it may be seen. It is perhaps excusable that so much attention should be bestowed on what is so difficult of obtainment, and comes so late in life. Until the introduction of mercurial mirrors, the Chinese used polished metal ones. (Attached to the breasts of their idols there is to be found such mirrors, the object being to afford the god an opportunity for reflection. To this day the Chinese look at the eclipses of the sun mirrored in a basin of water.) The people wear no wigs, although they do wear false hair in their coiffure and queues. Where hair is sparse on the head or eyebrows they have recourse to Chinese ink or charcoal. The former, from its containing glue, is often applied to the surface of swellings to prevent their enlargement. Moustache dyeing is a good deal resorted to among the *literati* and officials of low rank, who still look forward to the sweets of office or of higher appointments. An unequally coloured beard, it is said, would debar from audience of the Emperor.

Spectacles of glass or crystal, with broad tortoise-shell or brass brims, are in much use among scholars. Many of them feign the need of glasses to give themselves a literary air. No officials wear glasses in presence of the Emperor. The eyesight of the people remains good, and very few, in advanced life, feel the need of spectacles.

When the country is plunged into mourning by the death of the "Son of Heaven," what a change comes over the aspect

of the people! No sooner has one got accustomed to it than quite as striking a change takes place in returning again to the use of the razor. In the prospect of national mourning, and especially to avoid passing the height of the summer with such a thick crop of hair, every Chinaman is most anxious to get shaven as late as possible, until such a time after the Imperial death that the newly shaven pate shall not strike attention. When shaving cannot be employed, a little careful clipping for a short time may be resorted to. If another Imperial death should take place just before the expiry of the former period of mourning, the conditions, of course, become much worse. There is, however, generally some compromise and a compounding of the period of mourning. The same rule would hold as to mourning for parents. Any infringement of the regulations relating to the hair would be severely punished. When it is allowed to grow a few days beyond the regular time, there is headache and inflammation of the eyes and general discomfort. Foreigners experience the same thing more or less. Cabbage and other leaves, turnip skin, &c., are applied to the temples to allay headache or cure inflammation of the eyes. Onion or garlic is also applied as a counter irritant. It leaves a dark brown stain on the skin. Infusion of gentian is also frequently used in "fire" in the eyes. In headache a few drops of oil of peppermint applied to the temples is a very efficacious remedy, and much resorted to in China. As after shaving the susceptibility to cold is increased, the Chinese during any illness, or during convalescence, never shave. With long, dark, warm hair, combined with dirty sackcloth, as in the case of the mourner, the condition is not inviting. The beggars go about the streets with unshaven and uncombed locks of repulsive aspect.

Of skin diseases of the scalp among the beggar class, who practically do not shave, favus, eczema, porrigo, abscesses, sinuses, &c., infest them and run riot in their filthy uncombed hair. Where the practice of shaving is regularly resorted to, diseases of the scalp may be said to be rarer in China than in the corresponding class in Europe, although

by no means so rare as might naturally have been anticipated under such favourable circumstances. With such facilities for the application of remedies, it will naturally be inferred that such diseases are very amenable to treatment. Disease of the scalp of women is of course correspondingly difficult. Eczema is sometimes seen as the effect of shaving. This the Chinese attribute to want of cleanliness in the razor. During rain the handkerchief or sleeve of the jacket is made to cover the hair of the head, the common belief being that *pediculi capitis* are bred by rain-water falling on the hair.

In concluding our remarks on the head, we would observe the custom in families where death has removed the sons (in China sons are specially desired and prized to hand down the family name and worship at the tombs of their parents) of placing an earring in one ear of an only son born later, to make it appear to the evil spirits, who are supposed to be continually plotting the destruction of the male children (from an idea that in the other world female children already abound, although doubtless it is to be explained by the loss of what is most prized), that the son is a girl and therefore not worth removal. At the time of marriage the ring is removed.

As a part of the Chinese toilette, the care they bestow as a rule on their teeth may be noted. The first operation in the morning and after each meal is the rinsing of the mouth with hot water or tea. They also use a tooth powder chiefly composed of powdered coral. The Japanese export a large quantity of tooth powder into China. The Chinese beggars have most beautiful teeth. Among a class of scholars and also some merchants I have found the cleansing of the teeth totally neglected, so much so, that in some towns there seems to be the custom, for what reason I have never been able to ascertain, of never cleaning either mouth or teeth. As might be expected, tartar collects in such abundance on the teeth as completely to hide them, and to form large exostoses, which project into the cheeks, emit a most disgusting odour, and

present a repulsive appearance. A common practice among the people every morning is the use of a tongue scraper of horn, with which to remove the coating which may have formed during the night. I have found no bad results flowing from this practice. I should think it indicative, however, of indigestion, or the passing of the night in an impure atmosphere. Without the mouth-rinsing and tongue-scraping, the people do not seem to feel refreshed.

In Japan the utmost care is bestowed upon the teeth. Each morning an acid plum is chewed, which has a good effect in cleaning the teeth, and this is assisted by fresh clean wooden brushes frayed at the top. Toothpicks are in constant use in the East, and are found swimming in each finger-bowl or placed on the table in suitable vessels. These are used by gentlemen largely during and after meals. At the conclusion of the meal, the Chinese use a cup of hot water, which is set into a receiving bowl for rinsing the mouth, resembling similar utensils of glass in vogue in France. This procedure is tabooed at English tables. Our custom consists of wiping the tips of the fingers and the lips; the mouth and teeth are entirely neglected. In the East the mouth is rinsed after each meal. Such a practice is found very refreshing and a good tooth preservative. A few drops of lemon added to such water enhances the refreshing effect.

Coverings of the Foot.

The head and foot—the two poles, as it were, of the human microcosm—receive more than common attention in China. They use enormous quantities of shoes, and appear to lay much value on them. Torn shoes are rarely seen even among the poor; while absolutely destitute of everything else, a Chinese beggar will have a covering for his head (it may be in some cases the rice pot in which he receives his alms and out of which he eats his rice) and a pair of old shoes on his feet. The people never go barefooted, not even children. The stocking or sock is made of

thick calico, the sole of several layers sewn together with string, the remainder usually of two layers. In the shoe which it fills it looks quite neat and gives generally a degree of smartness to the foot and smallness to the ankle. This is increased by the custom of tying trousers, leggings, and socks together just above the ankle. This plan, besides neatness, secures comfort and warmth. Untied trousers at the ankle among women, in the north at least, is not considered respectable.

The custom in the south, of wide-flowing trousers, seems to prevail. Inside the stocking there is usually worn a cotton napkin, folded round the foot prior to putting on the stocking, which serves to keep the latter clean, fills it up and makes the foot look neater. After our first war Sir H. Pottinger told the Lancashire cotton manufacturers that he had opened up a new country, where the demand for their manufactures with which to make stockings alone, would employ all the industry of that industrious county!

In winter large white felt stockings without seam are used in the north, which are extremely comfortable, whether in walking, riding, sitting in a cart, or at home, or in a shop.

The Chinese shoe is made with very thick soles, which raise the shoe above the wet and mud, and prevent cold and moisture from penetrating it. For outdoor use they are sometimes an inch thick, and made of paper or rags pressed together with an outer layer of coarse cotton cloth stretched over it and sewn through and through all over with coarse string. In this way they become very hard and impervious to water and cold. The sole throughout is made quite flat, and without distinction of right and left. The shoe being made straight, and without special regard to the wearer, has any deficiencies of fit made up by the stocking. The shoes have no laces; they are reversible at pleasure, and thus the wearing down on one side with its attendant evils is prevented. The sole is always considerably shorter than the upper, in order to make up for the

want of spring in the sole. As we shall see, however, this arrangement has a speedy and disastrous effect upon the upper and the large toe. The sole, as already remarked, is made of paper or rags. In the former case any old book or price-list which is strongly compressed is extremely serviceable. In former times, when Old and New Testaments were so imprudently distributed gratuitously broadcast over China, it was said they were largely turned to this account and to other purposes. The preparation of the sole from rags is unique and worthy of adoption by us, in the preparation, at least, of cheap indoor and workshop shoes for the poor. Nothing is useless in China; every bit of rag is turned to account. The clippings and parings of blue cotton cloth, their worn-out garments, are pasted on a board and sundried, and when removed are sold in sheets like thin cardboard, which is cut, and numerous layers sewn together with which to form a sole. Here, then, are durable soles made out of that which in other countries would be turned or thrown on to the dunghill. In China it is not necessary to keep a thing seven years to find a use for it. A large trade is carried on in the public streets in the collection of rags and paper for this and the manufacture of paper. Shoes are always made for the household by the women of the house. Bootmakers exist principally for the manufacture of the official boots. Everywhere are small shops whose chief business is to sew on the uppers to the soles. This the women are unable to do. There is also a race of cobblers on the streets who patch and mend old shoes. Women's house shoes have generally thinner soles. The official sole is very thick, and white along the edges. This thickness prevents easy and rapid locomotion; but then etiquette requires dignity rather than speed, and walking seems quite out of keeping in an official; his gay silk figured robes correspond badly with the universal blue cotton of the common people and the general squalid surroundings of Chinese streets. A sedan chair or a cart is always preferred to walking, which is thought *infra dignitate.* Walking and exercise generally would do the officials much good in preventing

that abnormal corpulency to which so many of them attain and after which they strive. This sedentary life too of theirs produces and encourages such habits as opium smoking, which would be avoided by a more active life and less leisure. The boots of the Court costume are squared at the toes, instead of being round and tapering upwards as those worn on other occasions.

The uppers are usually made of satin or black cotton cloth. They are either plain or variously ornamented. Each district of country has its particular make of shoe and decoration. Special localities and trades may be recognised by their shoes. (The people of the same trade as a rule come from the same place.) The uppers in front and at the back in the middle line have a ridge of leather which strengthens them, and in front form a kind of a box for the toes. The uppers are always made larger than the soles, and project, therefore, considerably beyond them. In walking this exposes the large toe to continual pressure on the ground and causes much pain, and proves detrimental to the upper, necessitating very soon a patch, and to be respectable (for no Chinese would dream of paying a call of ceremony with a patched shoe) rendering the purchase of a pair of new shoes necessary about every two months, and consigning the old ones to indoor use or use in bad weather. The lengthening of the upper beyond the sole is necessary to give sufficient spring in walking, the sole being thick, flat, and inelastic. The upper is always made exactly the size of the foot. The small upper and the smaller sole give an appearance of smallness and neatness to the foot, which is of course much desiderated. Apart from these artificial modes of giving a small and elegant foot, it may be remarked that the Chinese have naturally very small neat hands and feet. Nothing is more striking in foreigners who have adopted the Chinese costume than the large size of their feet. Their shoes have all to be specially ordered, none are to be had ready made. It may be that they seek the comfort of a larger shoe and one with the sole co-extensive with the upper.

On account of the form of the shoe and the pain sustained by the toe, two trades are supported in China—one is the cobbler who is required to imprison the exposed member by a patch; the other is the chiropodist whose duty is to pare the nail as short as possible. The slightest length of nail gives excruciating pain, the paring often sets up onychia and ulceration of the toe. The Chinese do not suffer so much from corns and bunions as Europeans. The soft cloth shoe is not favourable to the formation of these results of tight and hard leather. Corns are, however, sometimes seen, but they are generally on the sole. This, along with abscesses and anæsthesia of the sole, are to be traced to the ridges caused by the coarse sewing of the stockings and shoes with string, and the annoyance of unequal pressure set up in the cuticle and the tender sensitive parts under the skin. In rainy weather the Chinese have a watertight leather boot with large-headed nails. The Mongols at all seasons wear similar boots of leather, lined with sheepskin, and worn without stockings.

In winter a large warm shoe is worn, thickly wadded with cotton, and called *mien wo.* These winter shoes are worthy of adoption for house use by all who are troubled with cold feet. The felt stockings are also to be highly recommended. In the winter common, coarse, cheap fur hoods, gloves, and shoes are sold in the north. The ordinary foreign slippers are not as a rule over-warm.

Children's shoes are pretty and highly ornamented with figures of tigers' heads in front, as they have a tiger or cock's head in the red hood which they wear.

Chinese ladies' shoes are elaborately embroidered and ornamented, the work of their own hands. The shoe has usually a thin sole of wood, with a heel-piece somewhat thicker, and coarse native cotton cloth stretched over it. The foot in length rarely exceeds four inches; they are even smaller than this in the south and among well-to-do than among the poorer people. All try to secure as small a foot as possible, and to attain their object they will undergo any amount of suffering. The binding of

the feet is commenced at the age of four or five years and kept up during life. Once bound, the foot is useless after a time when unbound. If unbound early, the foot may partly recover its former shape and use, although when it is adopted, as in some mission schools, the shoe is filled up with cotton wool, but the gait is always more or less mincing and betrays the former compression. At night the feet are unbound to be washed and powdered with alum, or for the cleansing of the bandages. The feet are then put in tight shoes to prevent the effect of the bandaging being undone. The women of the poorer classes, who work for their living in the fields or on the water, have frequently large natural feet, or when bound are considerably larger than the very small feet. Custom and respectability demand strict conformity to the old established usage if marriage is to be secured and a position in society maintained. The custom has existed for nigh a thousand years and shows no sign of change. Several high officials and others have refused to mutilate their daughters' feet. At Peking the influence of the Court has been felt, and large feet among the Chinese are not by any means uncommon. It is quite a mistake to suppose that the small foot prevents gadding about, which is the reason supposed by some, if not for its adoption, at least, for its continuance. They walk great distances, make good nurses, and generally do all the work of the house as effectively as their large-footed sisters. I have been struck with the immunity from disease enjoyed by the small foot itself as the result of binding, even in scrofulous children. The foot seems to adapt itself to this mutilation far better than could have been supposed. The same cannot be said of the practice of tight-lacing in the West. The foot really consists of the large toe from the ball to the apex of the extreme phalanx. The five small toes are turned under by the bandage and become the sole of the foot. The heel is thrown up into the ankle, which is usually large, ugly, and out of all proportion to the size of the foot. Between the heel and the ball of the big toe there is a deep sulcus. The skin of

these "golden lilies," as they are poetically called, is very wrinkled and dry, and the foot is never by any possibility seen by any one, not even the husband and relations.* There is a piece of embroidered cloth which is placed round the ankle to cover the portion of the leg between the trousers and shoes and where all are tied together. They wear no stockings, only the bandages of white cloth. Among the lower classes a small portion of the naked foot may be seen here. In walking they appear to support themselves on the heel, but in reality in the upper classes and with the tiniest feet progression and support spring from the ball of the large toe. The origin of the custom arose on the part of the ladies of the harem out of jealousy at the attentions paid by their Imperial master to a rival who had naturally unusually small feet, resembling the new moon, and hence bandaging was resorted to to gain the desiderated smallness, in the hope of obtaining the corresponding devotion. This account of the origin of the custom seems highly probable, and is the usual course pursued by Dame Fashion.

The Manchus have high heels under their flat soles for outdoor use ; the piece of wood which covers the entire sole has a high central piece from three to six inches in depth with cotton cloth stretched over it. It resembles somewhat walking on thick clogs or low stilts. It serves the purpose of keeping the beautifully embroidered shoes off the ground and out of the dirt. The Manchus as a race are taller than the Chinese, and this adds considerably to their height, and the long dresses worn by them, coupled with their usually bright, gaudy colours, add to the height considerably of their figures. At home their shoes resemble those of the men, and have flat soles. These high pieces in the middle of the Manchu female shoe are not to be compared with the high-heeled boots and shoes of Western lands. The Western high heel does not even secure the foot from the damp and mud ; and we know that the feet

* For the History of the Small Foot, by the author, see the *Chinese Recorder* and Reports of the Peking Hospital.

are particularly susceptible to a chill, and are the fertile cause of much pulmonary disease. In our wet, damp, cold climate it is of prime importance that the feet should be thoroughly protected. This is not secured at present even by the thickest soles, the most watertight arrangements, or the use of waterproof or rubber overshoes. The heel is by nature intended to bear the chief support of the weight of the body. The present arrangement of placing it well forward, apparently in imitation of the Chinese bandaged foot, causes the centre of gravity to be moved forward, and entails an unnatural bend forwards of the body, the displacement of important organs, and the destruction or impairment of the wise architectural arrangements of the arch of the foot. There is neither ease nor security in walking, and very soon the foot sways over to one or other side and the appearance becomes hideous. The grace of proportion is sadly disturbed by the tiny high heel, and the large expanse of ankle and unnatural heel above resembling a pagoda or spire turned on its apex.

Dress of the Common People.

The clothing of the lower classes and the peasants consists simply of short jacket and trousers of blue cotton cloth. Among the better classes of the common people, including the small merchant class, there are, in addition, over-trousers, or leggings, and an inner shirt or jacket of white cotton, which, turned over at the wrists, gives a white, clean, and tidy appearance. No shirt or underclothing, in our sense, is worn by the Chinese, unless their inner garments, which are but duplicates in every respect of their outer one, be so designated. The cotton cloth of their clothes is for the most part of native manufacture, being more durable than foreign fabrics of the same material, and more suitable when worn out to make into shoe soles than the foreign article, which, being fine in texture, and after washing out the size, is rather poor, thin, and unsuitable for shoe-sole use. Moreover, in the winter, in the country, when all agricultural

work is in abeyance, the chief employment of the people is the manufacture of this material, a state of matters which until lately obtained also in our own country.

Dress of the Upper Classes.

Silks and satins were originally confined to the official and literary classes. Their use has now extended to wealthy merchants, who in most cases have purchased the right to wear a button. The dress of men consists of two or more long robes, the inner of thin silk, the outer varying according to season, both as regards material and character of lining. The outer robe in winter is lined with fur; above is worn a jacket, usually of figured satin lined with fur. The various colours of which the dress is composed, contrasting or blending, as the case may be, with one another, gives a pleasing variety to the costume. The only difference between the merchant and literary class and the private costume of the officials lies in the greater richness of the material in the latter, and the wearing of cuffs to their robes of horse-shoe shape, and the use of boots instead of shoes. The dress of the Manchu women is similar to that of the men, consisting in the same underclothing and long, loose flowing robes. These robes, of figured gauze, silk, or satin, have a deep border of embroidery running along the central and side openings. Instead of the long robes of the Manchu, Chinese ladies wear a tunic reaching nearly to the knees, with broad wide sleeves, and a plaited skirt not unlike the kilt of the Scottish Highlanders, only longer, and reaching down to the ankle. The skirts look pretty and graceful, being equally removed from the two extremes of width and narrowness which have successively disfigured Western costume. The tunic or pelisse is richly embroidered. The Chinese dresses of all classes now button on the right side. The children are usually dressed in gaudy colours of short jackets of silk or satin and trousers of silk among the upper, and blue, or more frequently red, among the common classes.

In the official costume the silk material has interwoven with it medallions of dragons; the cuffs, usually turned back, are allowed to hang down at audience of the Emperor. On the breast and back of the tunic is an embroidered *p'u tse*, usually sewn on, indicating the wearer's rank, and the service, civil or military, to which he belongs. In the civil service, birds, in the military, animals, are represented looking towards the rising sun. Besides the button, the girdle-clasp, and the breast and back plate, the officials wear at times a peacock's feather, so arranged as to display one, two, or three eyes, and they hang slantingly down the back, and are fixed into a jade-holder which is attached below the button. These peacocks' feathers are conferred by the Emperor as a special mark of commendation for some official action done. The wives of Chinese officials also wear the *p'u tse* embroidered upon their tunic, but the position of the birds and animals is reversed, being made to look to the setting sun. Manchu ladies, when they wear the *p'u tse*, have it round instead of square. Officials and their wives also wear a long necklace of beads, the pendants being reversed in the two cases, in females being worn on the right, in males on the left.

To those who wish to study particularly the dress of the Chinese in general, the official costume, Court dress, wedding chair, bridal and funeral ceremonies, &c., in relation to materials, colours, &c., should study the clear, exhaustive, and interesting account given in the Illustrated Catalogue of the Chinese collection of exhibits at the Health Exhibition—the completest monogram on the subject ever written. It would take us too far from our subject to follow out the question on these lines, our object being merely to write of it more or less in relation to health. We can only glance at one or two points in relation to our special subject.

The bridal costume is the same in all seasons, consisting of a suit of red wadded silk, the Chinese bride wearing a jacket and skirt, the Manchu the long robe. During the marriage ceremony, and while the young lady is being

carried to her future home, she is covered with a square piece of woollen red cloth called a *k'ai t'ow*, like a tablecloth, embroidered at the corners with a phœnix, a dragon, and flowers, and with long yellow tassels at the four corners. It is placed upon her head. She is thus blindfolded as it were, and she requires to be led to the chair at the door. The chair is closely covered with the same red cloth, and until she arrives at her father-in-law's house, no matter how distant it may be, she is not at liberty to remove this veil. It is first removed by her future husband, who then looks upon his wife for the first time.

The warm, thick, head marriage dress and the similar coverings of the marriage chair are severe tests of the power of endurance in the too often young and delicate brides. That they should often faint and bow down under the load is what might naturally be expected. The costume is not wisely arranged for every, or indeed any season of the year, and least of all for the warm summer. In the depth of winter even it cannot be worn without much inconvenience and trouble, if not risk to life. The air of the close chair and closer headgear must prove suffocating. The same rigid rule holds also in regard to the clothing of the dead, the warm wadded winter clothing being adopted in their case ; and as, according to Chinese ideas, these clothes should be put on immediately before death, so as to guarantee admission into and official position (for the dead clothes always assume the official form, this being the position sought in life as in death) in the other world, and suffer no detention on the banks of the Styx, so in the case of the dying, death is often accelerated by the exertions necessary to don the dress, and afterwards, while life yet remains, the weight of it must prove detrimental. In the case of the bride this difficulty (for it is a felt one) has been got over by arranging the marriages in the cool seasons only. No marriages therefore take place in summer.

The Chinese are particular about sunning their clothes and bedclothes. This is very frequently done in good

weather, and the same operation is employed with the straw mat, which is besides carefully beaten to free it from any animals which may infest it. Before putting on clothes which have been placed in camphor as a prevention against moths, I have observed them carefully sunned, so as to deprive them of that anaphrodisiac property which camphor is supposed to possess. At night it is perhaps unnecessary to remark that the Chinese wear no nightclothes, but sleep in a nude condition. The very poorest have no bedding, and sleep on the mat in their clothes, with a brick for their pillow. A little higher in the scale the people possess a mattress and use their clothes for coverlet. They may or may not have a pillow of millet chaff. Higher still, there are wadded cotton or woollen coverlets as well as mattresses. The bedding during the day is rolled up to the further or inner end of the *k'ang*.

Foreigners in China have adopted sleeping clothes, which are a great comfort and preventive against diarrhœa, dysentery, chills, copious perspiration, exposure without covering in the warm nights in the tropics or tropical heat, viz., pajamas, *i.e.*, loose woollen jackets and trousers. The old-fashioned cotton shirt is quite out of date and ought to be abandoned; it serves no good purpose whatever, nor has it one single good quality to recommend it. I advise strongly the adoption by all classes in our country of these woollen night garments. Once adopted, and their comfort experienced, they will never be discarded.

DWELLINGS OF THE CHINESE.

"The best security for civilization is the dwelling; it is the real nursery of all domestic virtues."—*Lord Beaconsfield.*

In a climate where much of one's life is spent indoors, the dwellings must exert a powerful influence on man, physical, moral, and social. The dwelling furnishes in general the measure of the civilization of a people. From the childhood of the race to the present day a constant progress has been observable in the wants, pretensions, and taste of man and a corresponding arrangement of the dwelling. Allowance must be made for difference of climate causing difference in the use of material, mode of construction, as well as of domestic arrangement of houses. In the earliest ages the Chinese, like infant man elsewhere, lived in caves in the earth. They have arrived at their present condition through long ages of experience, and have adapted their houses, like their food and clothing, to their environment.

As to the *materials of construction*, Chinese houses are made of a framework of wood, upon which the roof rests and the gables and other walls are built in with grey brick. On account of the tendency of wood to decay we have no ancient buildings in China. The pagodas, the Great Wall with the walls of the cities, are the only permanent structures. Buildings dating back only a few hundred years have frequently been rebuilt and repaired more than once during that period. To prevent the decay of the wood as much as possible, ventilation holes are left in the walls, into which the pillars are built, and the foundations of such pillars are always of stone. To preserve as well as ornament the wood, it is in the best houses covered with numerous layers of a cement made of brickdust and blood, and several layers of hemp or tow, and the whole painted and varnished. The walls of the best houses are built externally of whole kiln burnt bricks, and internally of

broken brick and plastered with white lime. Round the foundations, which have invariably a course of stone, are several courses, usually thirteen, of whole brick both on the inside and outside. The walls are built of two shells, without any cross-binding, and the middle portion is filled up with small broken brick and mud. In the more costly houses and walls, and always in the foundations, quicklime is used, which makes a most durable structure. The bricks are often polished, and there are several styles of fitting them to each other, with more or less lime. Where they are in close apposition, the interstices are pointed with a blue lime, into which finely-cut hemp has been mixed. Outside walls of broken brick are invariably plastered with blue lime. This latter is more tenacious than the white, and permits of the lime being firmly rubbed, and leaves a smooth, shining surface. When the bricks decay under the windows or along the verandahs, and the polished surface falls off, the result of the weather, rain, frost, and natron in the soil and in the brick, giving it the tendency to effloresce, they are turned. In building with whole brick, every alternate brick is a half one. To facilitate this dividing, the bricks are scored down the centre previous to burning. As the Chinese trust to the roofs of their houses and walls, which always overlap, to preserve them, it is economical and serviceable to run up hollow walls in houses and fences. Houses are often seen with nothing but the pillars and roof. Where broken brick is used throughout, the ends of the gables are built of whole brick, and the foundation and copices are always of stone surmounted by brick. The use of mud in the walls of houses is objectionable in wet weather. The walls get damp and the paper falls off. The lower layer of whole brick and the course of stone is inadequate to prevent it altogether. To minimize or prevent the rising of the damp in the walls, the foundations are firmly beaten with lime mixed with earth. This in addition makes a solid bottom, and prevents subsidence. The layer of stone slightly raised above the level of the ground and the

courses of whole brick succeed. This adds to the strength of the wall, and besides affords a ledge upon which to rest the plastering. Where mud is used in the construction it gradually crumbles between the bricks and falls to the bottom of the wall carrying away the adhesion of the plaster. To prevent this, lime is sometimes mixed with the mud, but in the course of years the gradual crumbling of the walls renders even this of little permanent avail. Good mortar or pure lime is essential to dryness. Hollow walls conduce to dryness and warmth. Sometimes a layer of lime or slate or tightly bound straw crosswise is laid all round above the foundation to obstruct the damp. This layer of millet stalks on the sunburnt bricks of country houses seems tolerably effective against the rise of the damp. Tanned felt has also been recommended for this purpose. The ridges of the best houses are high and commanding, and are surmounted at the ends by dragon heads and other fabulous animals. The roofs are massive, with overhanging or projecting eaves, forming verandahs on two sides. The peculiar curve given to these roofs reminds one of the tent, of which they are doubtless an imitation. These roofs give the houses a nobler appearance than might be supposed from their being only one story. Tiles are in universal use in roofing the better houses. They are warmer in winter and cooler in summer than slates. Temples and verandahs are covered with round tiles, private houses with comparatively flat tiles. The tiles are always laid in furrows. Underneath is a thick bed of mud, which serves besides to keep out the heat in summer and cold in winter. To guard against leakage, this layer of mud receives a strong coating of plaster like the walls, and the tiles are laid above this with only sufficient mud to form a bed and prevent changes of temperature cracking the joinings of the tiles. A great objection to furrowed roofs, and especially where trees exist in the courtyards, as is so common at Peking, is that the former are covered with the leaves, blossoms, and fruit of the latter; dust also, blown so freely by the wind, collects,

water settles, vegetation springs up, the roofs leak, the timbers rot, and the house soon falls to ruins. A smoother surface of the roofs would avoid a condition which injures property so much and tends to its speedy decay. Some of the houses have flat roofs with balustrading, which permits of access to the roofs either for drying and sunning purposes, and sometimes in the country for the drying of grain and fruit where it is safe from thieves. In the country the houses generally are of mud or sun-dried bricks, with roofs of mud mixed with broken wheaten straw, or millet stalks covered with mud. Those of the better sort are roofed with slate or tile, in whole or in part, and built of stone with brick facings for the doors, windows, and gable ends. Imperial buildings are roofed with yellow glazed tiles. The walls of such buildings are built also with glazed bricks. The glazing is very serviceable against the ascent of the damp. The floors of Chinese houses, where they are not of earth, as in the case of all those of the poorer classes in town and country, are laid with large square bricks, sometimes glazed or made of marble. Boarding is not known, and wood is too expensive to be thus employed. Moreover, with the warm fur and cotton wadded garments and thick soled boots and shoes, the want of wood floors is not felt. In the better class of houses flues exist underneath, by which they are constantly kept dry, clean, and warm. The absence of boarded floors, with their seams, cracks, and joinings, into which dust, dirt, and water find admission and set up putrefactive changes, is an advantage in freeing the Chinese from one supposed source of contagion.*

* This subject has been lately investigated by Dr. Emmerich, of Leipsic, and has an important bearing on sanitary police and house construction. The attention of sanitary reformers has been directed lately, chiefly to the removal of all rubbish, excrement, kitchen, house and wash water, and the keeping clean of the underground of cities by means of water-canals or drains, and to the introduction of floors proof against the fungus and germs which underlie the foundations of our houses, and preventing the ground air with its deleterious organic particles from entering our dwellings. According to Emmerich, the

Chinese houses have no cellars. In the West, cellars are often dark and damp, and are in the near vicinity of the drains. These cellars are frequently occupied as shops and dwelling houses, more often as kitchens, &c., in the better

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most important source of these bacteria seems to be the spaces between the ceilings of one house and the floors of the house above. Disinfectants have been applied to privies, rooms, walls, furniture, clothes, washing—in short, everything has been subjected to bacteria-destroying substances, or to hot steam. These "between decks" in our tenements are filled with porous material to weaken sound and separate the heating of one floor from the other. Hitherto most of the matter used for this purpose has been either substances full of germs and fungi, or in a condition for their propagation and development, such as ashes, dirty sand, every possible filthy household refuse as filthy rags, straw, wood, paper, potato skins, hair, pieces of bone, vegetable refuse, and, in short, all imaginable filth. Emmerich, from chemical analysis, has calculated from the nitrogen contained, that in two new public buildings in Leipsic the quantity of organic matter thus employed was as great as if 3000 adult human corpses had been buried between the floors! By taking the material of old houses to fill up the new, in this way filth and seeds of disease are propagated from century to century. When we think of disease in dwellings, of the particles of matter floating in the air, of the traffic into and out of the houses, of the washing of the floors, of the heat of the rooms, we seem to have a suitable field for the development of the bacteria between the floors. This may explain the spread of some diseases such as consumption, the breaking out of fevers, &c. It has also been observed that a greater mortality occurs in the cellars and ground and third and fourth floors, than of the first and second flats, and this is not to be explained by the presence of poorer classes or worse nourishment. The greater mortality of the first two is attributed to the earth exhalations; of the latter two, to the floor filth caused by the larger number of inhabitants crowded into a smaller space, more household work, greater uncleanliness and dampness of the floors. What is required is a material which, besides its other properties of being a bad conductor of sound and heat, is not dangerous to fire nor too costly, nor a shoot for organic substances, and a breeding hearth for bacteria. Until this problem is solved, all misuse of materials should be carefully guarded against, and that neither matter from coups, nor organic substances should be employed for filling-in material in house-floors. What is also desiderated is some waterproof substance to prevent the water from getting into the floor-seams. Until this question is solved, it may be here only remarked that wood floors in a bed of asphalt as in the "Bethany" in Berlin, in French hospitals,

class of houses. Such places cannot surely be healthy residences for human beings; the walls of a house are, as it were, the outside clothes of the inhabitants of the house, and when these are wet, as they must necessarily be in such circumstances, we know what disastrous results follow. Dryness of walls and partitions is therefore essential to health. Walls ought therefore to be weather-proof and of sufficient thickness to ensure dryness and warmth. The Chinese with the absence of cellars are wiser than we. They neither descend into the bowels of the earth nor ascend to heaven, to secure a residence; they are satisfied to live *on* the earth. A foreign store at Peking was lately rebuilt with cellarage, which attracted great crowds of people, who gazed at the novelty of the procedure, and when finished they were equally attracted by the little windows which gave light to it placed a little above the level of the street. One or two foreign houses exist at Peking with extensive cellars, and these have always been a source of curiosity to the natives.

The ceilings of the palaces are richly panelled and ornamented, and, owing to the absence of an upper story, the rooms are built of a lofty character. The ceilings of the inferior houses are made of reeds, and papered. To husband the heat and render warming easy and inexpensive, the ceilings among the lower classes are placed low. They cannot afford to practise a method which carries off the heat generated by their stinted store of fuel.

In small houses low ceilings are desirable. They induce

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barracks, schools, &c., and also in the new forts at Metz, is worthy of imitation. The plan of oiling and painting floors is to be recommended, and when floors are washed, they should be wiped dry at once, and it is advisable also to make boarded floors as free of joints as possible. The continental or inlaid floors of hard wood, polished and varnished, seem excellent. Consult article entitled, "Ein Krankheitsherd in unseren Wohnungen," 'Frankfurter Zeitung,' Ap. 10, 1883; or "Die Verunreinigung der Zwischendecken unserer Wohnungen in ihren Beziehungen zu den Infektionskrankheiten von Dr. R. Emmerich" ('Zeitschrift für Biologie von M. von Pettenkofer und C. Boit,' Band xviii. Heft 2).

economy in construction, facilitate warming, prevent overcrowding, and add to the comfort of the lower classes. The upper portion of their rooms must not become a mere reservoir for over-heated, stagnant, and vitiated air.

In the north of China, where much artificial heat is needed for the long winter of four or five months, the k'ang or brick-stove bed, over which the bedding is spread, and under which a fire is kindled in winter, is an excellent arrangement, and especially among a poor people. Among the very poorest it saves bedding, the clothes worn during the day being the common covering at night. For that numerous class of beggars found in all large Chinese cities this arrangement suits well. For a farthing they can secure a warm k'ang at night, a drink of hot water, and a common coverlet which is let down over them at night and raised again in the morning. In the Imperial poorhouses the same arrangements obtain, sixty or seventy being huddled together on one k'ang, so dense sometimes as to bolster up one another. Hot water is also served to them, and cold water is thrown about them if any should prove unruly. Contagious skin and constitutional diseases spread rapidly in this way during their winter sojourn in these houses of refuge. Hospitals and schools can be conveniently heated in this way. It is not unhealthy provided ordinary ventilation is adopted. It is peculiarly suitable for old persons and young children, and the delicate generally of both sexes, who would do well to pass much of their time on them by day during our rigorous, cold, damp, and treacherous weather. Much bronchitis, pleurisy, pneumonia, and phthisis, in short, affections of the respiratory organs, would be avoided by its adoption in our own country, for the very young and the aged in winter, and especially those living in cellars or in ground floors. I should strongly recommend their adoption in these circumstances, provided means of proper heating can be secured. With us the use of bitumenous coal would necessitate the fire being placed outside. If adjoining the kitchen, or boiler, or washhouse, could the heated air, or steam or smoke of these places not

be made to traverse flues under such a bed, or could the warm smoke of the chimney not be made to pass through the flues of such a bed and ultimately re-enter the chimney? or could not the heated air of the chimney, deprived of its smoke, not be made to enter both the room and such a bed? I have sometimes thought that the heated air and smoke from our public works might to some extent be employed in warming the houses of the poor. The plan of heating whole tenements from the cellars or ground-floors of means of hot air or steam would be both effective and economical. Having an abundance of cheap coal, we have not yet been driven to economise our coal nor to invent cheaper and more effective methods of heating our houses and of employing the waste products of our coals and fires. The adoption of a stove-bed would save many lives from bronchitis among the aged and young children, who during many months of our year should never be seen out of doors. It would render many a trip to the south of France unnecessary.

These beds are made of rubbish covered with large flat square bricks having flues built under the bricks, and upon which they rest, and through which the heated air from the k'ang, kitchen stove, or external heating furnace courses. In the better houses no smoke from these flues enters the apartments, the heating apparatus being outside; among the poorer classes the heat, after penetrating the k'ang, escapes by holes at the two sides and helps to heat the room, in addition to the heat emitted from the chimneyless and smokeless fire, which is great. These holes permit also of steam or vapour being driven out and not allowed to condense. In inns and some houses in the country the flues are heated indoors with millet stalks, and the smoke becomes a nuisance. At night, before retiring to rest, the poor people in summer, who cannot afford mosquito curtains, burn artemisia in the house to drive out or suffocate the venomous and preying insects. The k'ang flues are repaired each autumn, this being rendered necessary by the flues getting blocked up either by rats' nests or burrows,

the breaking of a brick or other cause. Before the stove bed is used it is well heated to dry it beforehand. It is then covered with a straw mat, which may have some loose straw under it, and above it felt is frequently laid, and over this the mattress and bedding is spread.

During the day these are rolled up to the inner part or foot of the bed, the outer being the head or place of honour where the head is placed. This position is selected from the freedom which it gives to breathing and to the head, which is the honorific part of man. As everything is reversed in China, foreigners will be found preferring to sleep with the head inwards, and removed from the fire and gases. During the day a small table is placed on the k'ang, off which the meals are taken or tea drunk, and at either side the guests are seated, the left being the place of honour. This bed platform is built in the poorer houses against the window, which allows the female inmates to sit upon the warm bed and have sunlight to carry on their sewing and embroidery. The fireplace is conveniently situated for heating the bed, but is in a highly dangerous position for the children by night or day, crawling over the edge, and falling into the fire or boiling water and getting severely burnt or scalded. I have seen numerous cases of this sort, some of them proving fatal. The bed-clothes sometimes also catch fire, and the k'ang is sometimes so warmly heated as to burn the mat and bed-clothes. In the depth of winter, when the fire is kept on all night, fresh coals being added at bedtime and the ventilation not attended to, cases of asphyxia not infrequently occur Among other accidents connected with the k'ang is the introduction of needles into the hands of the women, who having dropped their needles on the mat and searching for them, find them penetrate the hand and break off. The loadstone, which is had recourse to for their extraction proves utterly useless, so deeply embedded are they usually in the hand.

During the day the k'ang is turned into a sort of drawing or dining room or lounge, the rolled up bedding

forming an agreeable pillow. Taking up one's bed and walking is easily executed in China. On the streets and in the country the people may be daily seen with their bed on their shoulder or head, or under their arm. A brick, a stone, a tile, or a few books serves well for a pillow. For summer use there are rattan pillows and also hollow porcelain ones in the form of a reclining child, which serve the purpose admirably and keep the head cool. At this time they place a fine southern or Shantung made mat over the mattress, and also cover their pillow with the same material. The punkah is not in use in China except among foreigners in the south. In the summer the better Chinese sleep under mosquito curtains. Among the lower classes, rolls of artemisia (which hang burning from many shop doors, for the convenience of tobacco smokers) and incense sticks (burned in incense bowls) or incense coils (twisted round wire attached to an upright rod which is fixed into a wooden tray) are burned or the house smoked just before retiring for the night. After sunset crowds of insects in the summer evening fly into the house and flicker round the lamps, and there end their existence. I remember one night several years ago seeing a host of small green-winged insects, common at Peking, which appeared in millions and died in myriads. There was no escape from them except by extinguishing the light and closing the doors and windows. This visitation was observed by foreigners as well as Chinese on the same evening as very remarkable.

In Mid and South China these earthen k'angs do not exist, their place being taken by wooded beds, which are not unfrequently so large as to constitute alone a kind of room, with compartments and panels, ornamented with painted gauze and silk, and very costly.

But not only the bed but the floors of the best houses have often similar flues arranged under them, with a double layer of large square bricks, which keep the rooms, walls, and floors, constantly dry and warm. The Romans seem to have had similar *hypocausts* in their houses. The

apartments for the warm baths at Pompeii had double walls and floors, between which the steam diffused itself. This plan, too, is worthy of adoption for cellars and ground floors in particular, and for schools, hospitals, and public offices with brick floors; in fact, such a system might be rendered compulsory for all brick-floored houses, inhabited by human beings, whose lives are surely quite as valuable as those of many animals. In Peking the Imperial elephants, tribute from Siam and Burmah, live on such floors. A further improvement in very cold damp climates would be to have such hot air circulating also in the walls and behind the wainscoting.

Mode of Construction.

The first thing that strikes a stranger in a Chinese town is the *height* of the houses. They never as a rule exceed one story. Where more than one story is attempted, a second is the limit, and it is called a *low* or upper story, and is rarely inhabited. These one-story structures give rather a mean appearance to the houses, streets, and towns in China. This meanness is increased by the arrangement which sets the best houses occupied by the family back from the street, the entrance to which is through a gateway, often not very pretentious. This style of architecture is dictated by ideas of geomancy, high houses being supposed to counteract the flow and purifying and health-giving properties of the air, preventing obstacles to the movement of aerial wind influences, attracting and concentrating those that are malignant, overlooking one's neighbour and thus destroying the privacy and seclusion of family life; in towns, overlooking the city walls; in Peking, overlooking the Imperial palace, and, in short, impeding and influencing the wind and water influences of earth and sky. Some of these reasons, if translated into modern scientific language, might not seem so absurd and superstitious as they appear. For these reasons much objection has been offered to the erection of tall foreign houses with

chimneys, and churches with lofty towers and spires. The Roman Catholic Missionaries have erred greatly in this respect in putting up churches and cathedrals, in utter disregard of the native ideas of *feng shui* (wind-water) and Chinese architectural taste. Although not conforming to the Chinese ideas of *feng shui* in respect of their buildings, the Roman Catholics have no objections, at the dedication of them, to follow the native superstitious ideas of fire-crackers to frighten away evil spirits. The Chinese Government sent its representatives at the laying of the foundation stone of the cathedral at Peking, but before its completion the same Government had to erect high walls to screen the lofty building with its unfinished towers (spires, it is said, being the original intention) from public view. The prejudices of the people are sufficiently strong against us as foreigners, without adding objections to us as religious teachers. France is specially responsible in this respect for much of the antipathy created against foreigners in China. As Prince Kung once said to a British Minister, all that was wanted to ensure peace between the two countries was to take away opium and missionaries. The height of foreign structures and chimneys has been the cause of much ill-feeling among the people.

Houses of one story make the people really sons of the soil. With houses all of this height, and the rooms running through the whole depth of the house, ventilation and lighting are not difficult. If they were all high and built in blocks, with dead stagnant courts of air, and with partitions at all angles and running in all directions, ventilation would be rendered difficult if not well nigh impossible. The dangers of dampness arising from this arrangement is avoided by heated k'angs, thick-soled shoes, and warm clothing. Although Chinese houses are of one story only and without cellars, good houses are always raised above the ground, or the courtyards are lowered to prevent the houses being inundated. Houses of one story only save much trouble and fatigue in ascending and descending flights of stairs, which is such a trial to infants,

delicate women, and old persons. The question of carrying up the water supply or taking down the house refuse does not consequently enter into Chinese house management. Houses of one story, and built as the Chinese are, prove favourable in times of earthquake. Houses are almost obliged to be of one story from the very style of their architecture, wooden pillars of no great diameter being used to support unusually heavy roofs, and their windows being of the whole breadth of each compartment of the house. Wood, too, is expensive, and without wooden supports no house is erected, hence upper structures would lack security. The chief reason, perhaps, that solid masonry without wooden pillars has never been devised is to be traced to their ideas of family life and the relative position in the house of the various members of the family. This idea was forcibly expressed when the Emperor Kien Lung refused to drive in the handsome carriage presented to him by George III., for the obvious reason that the coachman had a higher seat than the "Son of Heaven!" Chinese houses, therefore, are but the expression of their social, political, and cosmic philosophy, which the erection of lofty structures would upset.

It is to be observed, also, that although the streets or lanes may be straight, the individual houses never are. Houses placed in direct line adjoining one another are opposed to the ideas of wind-water, consequently houses are built at an angle to other houses. Were it not so, evil influences would find nothing to obstruct them in passing from one house to another, and calamity and disease might find an easy mode of propagating themselves. Houses supposed not to have good wind-water influences are often pulled down and rebuilt at a different angle, or they are vacated and sold, or frequently stand empty, especially if a suicide or frequent deaths have occurred among the inmates of the house. I have seen a new house pulled down in order to alter by a few inches its relation to adjoining properties.

The next point about Chinese house construction that

strikes a foreigner is the *aspect* of the houses. Nowhere is this subject so much attended to as in China. More importance attaches to this point than at first sight appears. It affects the great questions of light, heat, comfort, health, and disease. All the main dwellings of the Chinese face the south. Houses with street entrance facing the north are constructed to have the front entrance of the dwelling house on the south. In lanes running east and west, houses and shops on the north side, with of course a southern entrance on the street as well as exposure, are of considerably higher value. The best houses are always found on the north side of a lane having a southern exposure. The towns are so laid out that the business parts as a rule are made to occupy north and south running streets; the east and west running lanes are reserved for the private houses. The entrances are on the north side of the lane, the back doors of the houses, similarly situated in the lane to the south, being on the south side of the northern lane. The walls of cities as well as the individual houses are laid out exactly facing the south; consequently at midday the shadow is directly in a line with the front door, and the shadow made by the pillars on the verandah give a good idea of the time of day.

[This is a great convenience to a people who depend so much upon the movement of the heavenly bodies, and whose daily life and actions are so closely connected with solar and lunar observations. It has been said that the Chinese walk with their feet on earth and their heads in heaven. All their actions are regulated by a regard to heaven, the gods, spirits, the "Son of Heaven," the being of "ten thousand years," and their ancestors. On a cloudy day the common Chinese (for all the better and official classes, the latter without exception, now carry watches) have to regulate their time by the state of the stomach. The time arranged to be calculated by the Prime Meridian Conference, from midnight to midnight, making twenty-four hours, and so reckoned, can be easily made available in China, their day being already divided into twelve hours of two hours

each, and consequently each Chinese hour into eight quarters. Watches are now made for the Chinese market with the dials arranged according to the Chinese horary characters, which, being monosyllabic, prove more convenient in many respects than the barbarous nomenclature proposed to be adopted by the new twenty-four o'clock system.]

Europeans rarely think of this matter in the selection of a site and the building or renting of a house or shop. The houses with the southern exposure are warmer, pleasanter, and healthier. More regard ought to be paid to this point in Europe. In the West, even with our flats, high houses, and courts, there is no reason why the chief rooms should not always look south, even in houses facing the north. Not only would health and comfort be improved, but the back courtyards and backs of houses would thus become improved, and such houses (as probably all should be) would thus be equally respectable on both sides. This would necessitate more space between houses, which in itself would be a sanitary improvement. The backs of south-looking houses on one street would thus face the back, now become the front, of houses looking north. People prefer to look into public streets rather than into back dingy, close compounds. The present proposal would rectify all this, and the subsidiary rooms of a house, such as kitchens, bath-rooms, &c., would not monopolise all the light and heat which ought to be absorbed by the sitting rooms of the family. So little of the sun is seen and felt in our large towns that the more of it we get the better. The value of aspect seems to be appreciated by the public, as witness the preference shown in the establishment of shops and in promenading on the sides of streets facing the south and west, the two best exposures.

Shops are built on the street with the entire breadth of the shop open to the street. Business is thus carried on to a great extent in the open air, and this has doubtless much to do with the healthiness of the occupations.

No private dwelling houses are found directly on the streets. The lanes are selected for their quietness and re-

spectability, and even here the houses are entered by gateways. It would seem odd to the Chinese to enter the house directly from the street, and to have all the world passing your threshold and able to look in at your windows and doors. This is strongly opposed to their ideas of the requisite seclusion of the family, and especially of its female members. Chinese houses are laid out in a series of courts, the better class having invariably a reception room, offices or male servants' quarters in houses on a line with the lane. This forms the outer court of the house, and which is first entered. The second court is entered by another gateway having verandahs running round it. In front, facing south, is the main house with its two east and west wings, each having a small private court of its own, and communicating through the verandah with the chief court, which has two east and west side houses. In courts to one or other side of these side and wing houses are the female servants' quarters and other offices. On the opposite side is placed the garden, with its rockeries, pavilions, wells, lakes, mountains, bridges, tanks with gold fish, smoking room, and library. In the best houses a large building is usually set apart for private theatrical representations. These are often exquisitely panelled, ornamented and painted. Vegetable gardens do not exist in the city, and the people do not cultivate them. In their gardens only flowers are reared, but even these in the city, by virtue of the badness of the soil, are seldom found. Immediately outside the walls are the grounds of the florists who bring in to the city all sorts of shrubs and flowers in pots. These are taken back on the approach of winter to the hot houses which exist outside the city. These are simply pits dug in the ground with a papered southern exposure. Behind the main court is a third and possibly a fourth court devoted to the Ancestral Hall, where the family gods are worshipped. The parents occupy the main house, the little children with their nurses the wings; the married sons and their families the side houses; old retainers are placed behind. If the aged mother be alive

she is assigned quarters in one of the side houses. The entrance to the main court in still higher classed houses is through rooms devoted to the reception of guests. The back verandahs of all the houses are taken into the houses. This renders the construction larger and cheaper, shorter beams being required, and it affords niches for divans or k'angs, and a suitable support to which to attach those ornamental panellings with which such houses are provided. The inner verandahs are left for the use of the family and the comfort of the house. In wet weather they afford the means of communication between the different houses, for there is no internal connection between the main and side houses and reception-rooms. In summer they keep the rooms cool and afford a place under cover for cooking and sleeping. The number of compartments in the verandahs is reckoned among the number of apartments of a house. The houses of the poor have no such verandahs. Several families occupy a courtyard and enter by a small doorway on the street or lane. This mode of construction makes a Chinese town seem very mean from the street, nothing but bare walls, backs of houses and doorways (some of which are however very lofty and imposing). Family comfort is above external appearances. The poorest people are content with one *chien* or compartment. Higher in the scale the court arrangement obtains, and several families may occupy such a house, the centre apartment being invariably devoted to the family altar, having a Buddhist shrine and family genealogical table with red candles, fruit and incense burner, and mock ingot paper. The incense is usually kept constantly burning, and, like the vestal fire, is never allowed to be extinguished. The two side compartments of the main house are used as sleeping quarters. No brick partitions exist as with us. The poor people have reeds papered resting on a piece of brick wall, the higher classes have handsomely carved and decorated wooden panellings. Such partitions, it is evident, contribute to the ventilation of the various rooms and the distribution of heat. There is thus no thorough separation

of the various rooms. One can always look from one into another. The ceilings among the poor are of reeds covered with paper, and the walls are lime plastered and whitewashed ; among the better classes the ceilings are high and made of window frames papered. The walls are also papered. In best houses the ceilings are elaborately panelled and painted ; handsome horn lanterns or frames filled in with gauze beautifully painted, and into which candles are fixed, are suspended from the ceilings of the best houses. Houses always consist of an odd number of compartments—one, three, five, or seven. The centre apartments are always slightly broader than the side or end ones. In summer over the court or courts is erected a mat awning as a protection from the sun, where light and air, the foundation conditions of human well-being, find a rich place. These covered courts in summer form a part of the house. At marriages, funerals, or other grand occasions these mat awnings, often prettily ornamented, are in use for the reception of the guests. These awnings are so constructed as to permit of the roof being closed entirely by day and of being drawn back at night. In the poor houses a single straw mat is stretched on poles across the window, or hung between the pillars of the verandah if they have such. These awnings sometimes cover the roof of the house and so ward off the rays of the sun, which are very powerful in summer. In the narrow streets of Southern Chinese towns, mats or cotton awnings stretch from side to side, forming a sort of shaded gallery, piazza, or arcade along the whole street. When new shops are opened, immense structures are erected in front with poles, mats and red Spanish stripes ; lanterns are hung inside, and customers are invited to purchase their wares at a cheap rate, and thus buyers are gained and their trade gets established. Chinese merchants lay their account thus to lose money for the first year or two and then to make wealth. These awnings, called *kwa hung*, "hanging the red," are allowed to remain for three days.

Opposite the front gate, on the other side of the lane, and

also inside the door or gate facing it, is found what is called a *ying pei*. The latter shuts off the courts of the house from the gaze of the public ; the former that of the occupants of the house from opposite neighbours or unpleasing walls, houses, or views. Those on the street are formed after the manner of the Chinese figure of 8 or the roof of a sedan chair, and have some propitious sentence engraven on the brick or hanging on a scroll from it. Every occupant of a house seeks to have something of this sort opposite entrances of doors or lanes for purposes of *feng shui*. A piece of white plastered wall will often suffice. These *ying pei* are to be seen everywhere on the streets. On the inner one is arranged the offices, real or expectant, held by the occupant, printed on red paper and fixed into permanent frames or hung from hooks. Over the outer or inner door in the gateway is sometimes found a handsome gilt tablet, indicating that the occupant is a member of the *Han lin* Academy or Forest of Pencils, the highest literary qualification attainable in China. On the sides of the doorway may be observed the charcoal or water-chalk score of the street hawkers, and also the small card of the physician in attendance upon the family, who makes himself known by his "Hall" name. Every doctor has his distinctive Hall designation, and this is his advertisement, enabling the doctor at the same time to find the house of his patient when first called, without making inquiries of the neighbours. He may style himself the "Doctor of the Age" or the "Hand of the Nation," or his shop may be that of "Preserving the Heart" or "Maintaining Virtue."

The side lintels or doorposts, as well as the upper and lower lintels, have red paper scrolls of happy augury pasted over them at the New Year, reminding one of the Egyptian destroying angel. At the fifth moon the five poisonous animals, scorpion, centipede, toad, &c., are delineated, and certain plants hung up over the door, supposed to have antidotal efficacy. Houses in the country in the north have the outer door or gateway of a Y shape, with the view of admitting camels with their loads. All round the

houses and walls large white circles of lime are drawn to frighten away the wolves, the circle being intended to indicate either the rising sun or a nooze, both of which are a warning to these ravenous animals. The absence of glass makes a great difference between a Chinese and a Western town. On this account the Chinese concentrate their domestic life in the interior of their houses, which present to the street blank walls, with as few openings as possible, usually only the doorway and a few small ventilating high-placed windows in the buildings on the line of the street. At present a German company is about to start glass works in Corea, to supply that country and the adjacent China with window glass.

Let us briefly compare the Chinese house arrangements as now described with that of the Romans and we shall find many striking resemblances. The houses are entered by a door or gate *mĕn*, the *vestibulum* of the Romans, leading to the court *yuan* or *atrium*, rarely if at all in China surrounded by a covered passage, and forming the *impluvium* or reservoir for rain water, being the lowest part usually of the compound and that into which the water from the other courts drains before joining the street cloaca. Opening on this court is the large building forming the second or private gateway, and where a house exists, as among the better class, is a chamber devoted to communication with the external world. The Romans termed this the *tablinum*. The rest of the house is set apart solely for the family use. It has an open courtyard enclosed by covered verandahs, and corresponds to the Roman *peristylium*. This court is the medium of communication and light to a large extent to the various rooms. It is also low to permit of retaining rain water and so preventing flooding of the rooms. In the centre is usually a water *k'ang*, in which are gold fish, or ponds, in some cases with running water in which are lotus. This court is also sometimes laid out as a garden, or shaded with vines and other ornamental creepers, which in summer afford a grateful shade. On one side of this court is a private yard of the

character of the Roman *Xystos*, surrounded also sometimes by verandahs. At the back of the *peristylium* are other business rooms which the Romans called *œci*. The sleeping and dining (*triclinium*) rooms, servants' rooms, kitchens, &c., are placed round the principal courts and apartments. There are also stabling and flour-grinding courts at the sides. The *œcus* is to one side of the compound and the *Xystos* to the other. The centre room of the main building, and usually also of the other apartments, is devoted to the goddess of mercy or other divinity, and invariably contains a shrine along with the genealogical tablet of the family. On the table in front of the shrine are placed incense burners, candles, fruit and cakes offered to the divinity or ancestors. This altar is always covered with offerings and smoking with incense, especially at the New Year, birthdays of the family, or other feasts.

The shops, like those the visitor may see at Pompeii, expose their whole frontage to the street, from which they can be separated by large windows or doors. The shop counters, tables, and floors are fitted up with large earthen vessels for the sale of oil, soy, spirit, vinegar, &c. Behind the shop is a second room occupied by the shopkeeper, who may live there, or his apprentices, while he lives in a different part of the town. The number of these shops affords proof of the extent of the retail trade carried on in a Chinese town.

The selection of a site, the laying of the ridge beams, the completion of the house, &c., are regulated by geomancy, and consist of various superstitious notions to secure happiness, wealth, and male posterity, and avoid calamity, disease and death. We read elsewhere of corner stones and beams being brought forth with rejoicings. And in Germany the completion of the masonry of houses is celebrated by elevating a tree or bush to the top of the new structure. The Chinese geomancers consult the locality and its relations to mountain, river, neighbouring natural objects, or, in short, the "wind-water" influences, and decide accordingly. The cities, and individual dwellings of

the Chinese, whether for residence when alive or interment when dead, are regulated by these considerations. Foreigners frequently laugh at these superstitions, and a few learned Chinese have written against them, but apart from some superstitious ideas supposed to be connected with the *feng shui* of graves, and the effect of such locations on the health of the living and such like notions, there is a good deal to be said for this principle in a modified sense as leading to the selection of beautiful sites suitable exposure, &c. It is absurd, of course, when it amounts to leaving a house, or refusal to live in one because of supposed evil influences, a suicide or several deaths of the family having taken place in rapid succession previously, or because it is in too straight a line with other houses, &c., then the system becomes superstitious. But even here it is possible situation and other influences may have had an injurious effect upon health. The Chinese have no other way of accounting for these incidents. Like wars, famines, pestilences, inundation, they usually trace such influences to stellar action, to corruption and misgovernment, to the presence of foreigners, their high houses, hideous chimneys and such like. On account of these ideas, foreigners are sometimes able to purchase property cheaply which is quite unsaleable in the Chinese market. In towns there is not much room for selection of site, although even here the principles in relation to water, light, and sun's rays, and adjoining property, are taken into account. Buddhist temples in China are usually beautifully situated on the hills, or nestling in valleys surrounded by clumps of wood—resorts well adapted for contemplation and meditation previous to entering Nirvana. The situations sought for dwellings and graves are free, high lying, and sheltered from the prevailing cold winds—in North China the N.W. The presence of water or wells of sweet water is of prime importance in determining location. Even Hippocrates noticed that the higher elevated houses were healthier than those situated in low localities.

House Decoration.

Ornamentation plays a prominent part in the construction of the Chinese dwelling. Their decoration is of the most picturesque and artistic description. The Chinese do not stand in this respect inferior to any nation on the globe. It is pleasant to observe the engrafting into the prose of every-day humble life something of the poetry of artistic feeling. In China it is rare that we find any glaring violation or utter absence of taste, if we except the unavoidable thickness of their winter wadded garments. Occasionally rather striking colours or styles of ornamentation may from time to time be adopted by the "fast" young sons of the higher officials, but these are at once tabooed by the respectable and staid members of society. The inside ornamentation of the houses of the higher classes consists of beautiful furniture of hard southern wood, polished or inlaid; of large cheval mirrors placed in all positions, giving ideas of grandeur and extent; of embroidered satin or silk hangings for the doors, coverings of the chairs, tables, stools, and bed; of handsomely coloured silk or horn lanterns hanging from the ceiling; of porcelain vases, bronzes, cloisonné and flowers, natural and artificial, on the long tables ranged alongside of the walls or along and at the ends of the k'ang; of the rich panelled partitions of hard wood waxed or varnished, or of ordinary wood beautifully veneered, every knot in the wood being removed most artistically; of exquisite carving and the interspaces filled in with beautifully painted glass, flowers, or mirrors. The doors of the rooms and sides of the k'ang and alcoves are adorned with similar panelled work. These settees, divans, couches, or k'angs, earthen or wooden, covered with wadded reversible cushions for summer and winter use, with pillow and cushion rests ornamented with embroidered ends or covered with fur, and hung round with scrolls, flowers, and lanterns, make a most agreeable and artistic effect, and add to the charm of tea-drinking and conversation. In the reception-room, as

in all the rooms except the central one, there is the universal k'ang with its little tea table bearing the hot beverage and tobacco pipe, with a spittoon in front and straight backed ebony marble inlaid chairs arranged along the two sides, and the walls and ceilings are hung with scrolls or pictures from or by celebrated individuals. The ubiquitous bamboo is most commonly represented in Chinese drawings. Among the high officials there is the much appreciated yellow mounted and framed scroll with the character for *Happiness* written by the vermilion pencil of the Emperor or Empress and presented at the New Year to the high officers of State. A round table of beautiful Jehol inlaid work may adorn the centre of the room. Between every two chairs there is the invariable tea table for convenience of imbibing the refreshing beverage or indulging in the water pipe. The chairs and tables for the most part are of southern hard wood stained black and inlaid with mother-of-pearl and enamel. The table and seats are covered with marble tops. No carpets are found on the brick floors of Chinese houses. The thick soled shoes do not require carpets. The Chinese, while they admire, consider it foolish to lay down such rich carpets on our floors, and to walk over with our shoes. They always hesitate to enter a carpeted room, and they always try to get round the edges of it. Many of them take off their shoes outside the front door and walk in on their stocking soles. They think the best, if not the only place for such beautiful stuffs is the k'ang. As the exhausted tobacco ashes from their pipes and frequent discharges from the mucous membranes of the respiratory passages are in China thrown on the floor, carpets would prove a great inconvenience. Even with foreign carpeting it is sometimes difficult to prevent the Chinese who are strangers from following the ordinary custom. The carpets are extremely uncomfortable where Chinese guests are frequently received. It necessitates in many cases the Chinese going into the courtyard to smoke or to empty the ashes of their pipes. As these are very

small, and as the pipe is hardly ever out of the mouth, the inconvenience becomes very burdensome. Spittoons and ashpans of stoves, although available, are but poor substitutes for the freedom which the brick floors afford.

Wall paper decoration is unimportant in China. A cheap white printed paper that is used is confined to the foot square sheets of different patterns, with which the ceilings and walls are invariably papered. The lower part of the walls, the whole brick part, is frequently papered with a light blue coloured paper. The art of papering seems to have come from China, the paper formerly in use amongst us being precisely the paper of to-day in China. A cheap and tastefully printed wall paper bearing Chinese designs, like the foreign printed cottons now so much in demand, would soon supersede the native manufacture. Alum is employed in sizing and whitening the paper, and talc in rendering patent the designs. The Chinese have no arsenical papers.*

The main rooms of the house are furnished with such furniture. In the south furniture, bamboo, and rattan are much in vogue. In Central and South China they have the most sumptuous bedsteads, which alone constitute a kind of room with compartments and panels ornamented

* Lately one writer in the West has tried to show that no bad effects can arise in the use of such papers by the inhalation of the arsenic. To produce any evil effect there must, it is said, be mechanical detachment of the pigment from the paper, and any particles carried through the air must be in such homœopathic doses as could produce no harm. The inference, therefore, is that they are practically harmless. It is further argued, that if arsenic be so injurious as is supposed, when breathed, why can much larger quantities be taken into the stomach with advantage? Arsenic is found in the dust of rooms papered with arsenical paper ; there may be some idiosyncrasy, for all workers in arsenic works are not equally affected ; the same immunity is often seen in those constantly exposed to the evil influences of sewer gas, but who do not suffer from those diseases which arise from the escape of sewer gas into houses. Nevertheless, household articles containing arsenic in the state of either fine dust, of metallic particles, or of the volatile gas, are highly poisonous. Such is the unanimous experience of the profession.

with painted gauze and silk. Chinese ladies at marriage are presented with a toilette-case consisting of every requisite. It would take us too far from our subject to describe the procession of the most beautiful house furniture, bedding, clothes, vases, clocks, flowers, silks, geese, &c., which are carried through the streets on the way to their destination from the bride's own house to her future home. This is the Chinese bride's trousseau. We have already spoken of the decoration and ornament of the person and dress. The outside decoration of the house consists of beautifully designed window frames, painted balustrading work on the verandahs, vermilion painted projecting eaves and ends of the rafters of the roof. The shops are often elaborately carved, painted and gilded, and but for the rather mean appearance which their low height gives, would be imposing. Even as they are, many of the shop-fronts are grand. The gardens, too, contain all nature in miniature. If we except the walls, pagodas, temples, palaces, watch bell and drum towers, there is not much city ornamentation. The frequency of trees in Peking, particularly the handsome acacia — *sophora japonica* — gives the city from the wall the appearance of a vast park; the one-storied insignificant houses being concealed from view.

We might try to imitate the Chinese more in the decoration of our houses. By introducing more colour and harmony we should make them more cheerful and bright. Our dead bare walls and unadorned houses would be improved by the hanging scrolls and painted screens of the Japanese, and the scrolls, lanterns, and carved woodwork of the Chinese.

Houses in Europe are, as a rule, too full of furniture, at least for the size of the rooms, and the continental style of bare floors is certainly more healthy, and can be kept more cleanly.

Mode of Heating.

The ordinary warming arrangements of Chinese houses in winter consist of stoves either of brass, composite lime, or asbestos. (The latter substance is said to be made of dragons' bones. It is a species of clay which has scarcely yet been investigated by Europeans. Cotton or hemp can be made fire-proof with a coating of this substance.) In large rooms or halls the brass stoves predominate. They have a clay stove which fits into it, and which enables the fire to be lighted outside in the courtyard and brought into the room red hot. By this procedure the smoke of the wood or charcoal used in lighting the fire and the carbonic acid gas are consumed or driven off outside. The upper opening of the stove is small, so as to concentrate the heat for cooking purposes, and to cause it to radiate from the sides of the stove. The common clay stove is usually fixed into a wooden frame which permits of being easily carried into the courtyard when about to be lighted. Still, poorer people and the public restaurants and kitchens have a stove of brick, or a disused flower-pot or empty kerosine tin built into a wooden frame. The stove and fires inside are lined with a mixture of yellow earth, tow, and pulverised stoneware, which, when burnt, resembles a piece of solid fire-brick. On the side of the stove in front is a small draught hole, and below the receptacle for ashes. These stoves are cheap, simple, and effective, and the draught is sufficient to keep the hard coal burning. Coal balls about the size of a walnut, or small pieces of anthracite coal, are burned in these stoves. They emit a great heat, burn for several hours, and the houses being without chimneys, are of course rapidly heated. Additions of coal are made from time to time in the room. The fires are stirred from the upper and side holes. The cooking ranges are platforms with one or more such stoves built in them. To prevent suffocating the fire when any utensil is placed upon it, three little coal or mud balls placed at the side of the fire, support the vessel. The heat is made to warm a water

vessel, also built into the range and closely adjoining the fire. Adjoining the hole is a second hole, employed to keep warm things already cooked while the main opening is occupied. The heat is thus economised and utilized. A similar stove is built in front of and close to the k'ang, on which all the domestic cooking is carried on by the common people in winter. The same fire cooks the food, warms the room, and heats the bed. This is one of the most economical of arrangements. It does not, however, allow of the fire being lighted outside, and of course it very soon soils and blackens the papering of the ceilings, walls and windows. This with the generation of carbonic acid gas are the two evils connected with the use of the Chinese heating apparatus in the house. The first is met by re-papering, and the second by ventilation, and the placing of a basin of cold water on the k'ang close to the sleepers' heads, which is said to have the effect of absorbing the carbonic acid, or at all events of counteracting its injurious properties. The Chinese know this gas only from its asphyxiating properties. In front of the k'ang stove is a pit covered with boards for the reception of ashes, and which when full is emptied. The dust and rubbish of the house is usually swept into this hole, and but for the disinfectant qualities of the ashes, might prove a source of danger. In the better class of k'angs, the heating is carried on from pits which exist under the verandah. The floors when heated are likewise effected from this place. This plan of heating the bed or floor frees the house from smoke and the "choking" gas, and is quite unobjectionable.

Besides the warming apparatus just mentioned, the better class of people, especially ladies, use in the house and when they go out in carts or sedan chairs, hand and foot warmers of brass, copper, pewter, bronze or enamel, containing heated charcoal. Similar ingenious contrivances have been adopted as food warmers, charcoal being placed in the central compartment and soups and other dishes in those surrounding it, or spirit underneath requiring only to be ignited to warm up the courses. The Chinese style of

foot and hand warming might with great profit and comfort be adopted in winter for railway, omnibus, carriage, or tramway travelling, in church or cab, and save much discomfort and illness resulting from chills to hands and feet. They cause no stuffy feeling whatever. It would be almost impossible in any town of the United Kingdom to secure charcoal. In Switzerland ladies use foot warmers filled with the red cinders from their wood fires. On the Continent the railway carriages and tramway cars are heated with coal fires underneath—a great advance on the hot water warmers supplied to railway travellers in Great Britain. Could steam not be used for this purpose? We have succeeded in lighting our carriages with gas, will no one inaugurate heating reform?

Heating Material.

In the country dried grass, leaves, millet stalks, and roots are largely used for fuel. The people collect large quantities of various grasses and small shrubs, particularly the small thorny sour jujube tree, on the hills for burning. Everything that can burn is turned to account. In the towns horse dung is largely employed. Where the above fuel is burnt, the cooking is carried on in large cauldrons, raised very little above the ground, and the matter is burnt on the ground underneath them. These fireplaces in winter are placed in the corner of the house connecting with the k'ang, and in summer in the courtyard. One result of this extensive use of grass and shrubs is that the hills are bare excepting little clumps of wood in the valleys or on the hills surrounding Buddhist temples. The result of this in the North is drought and winds. If the trees were allowed to grow, moisture would be retained when the rain falls, and then moisture would beget moisture, and as a consequence we should have less frequent winds and duststorms. By conserving and planting forest and tree growth, the rainfall would be increased and equalized, reducing the torrid heat of the climate and fertilizing the soil. The very

grass of the fields is carefully raked, scraped, and even pulled up by the roots to be used as fuel. This increases the above conditions, thus showing that poverty leads to and causes greater poverty. In the towns the movable stores are turned out on to the verandahs or courtyards in summer. Wood in small splinters is used for igniting the charcoal. Wood is not cheap and hence not much used. Good dry wood is as expensive as coals, and not so economical nor so warm. The Chinese domestic stoves are not built for the consumption of wood. It is employed frequently by bakers in their ovens. Charcoal is largely used, and a great trade is carried on everywhere in its production in the country and sale in the cities. It is hawked about everywhere in the streets, and is very cheap. No coke is used. Coal both bituminous and anthracite is to be had in abundance at Peking, and is cheap at the mines in the adjoining Western Hills, but its carriage on camel, donkey or mule-back into the city increases very considerably its cost. Smoke or soft coal, as the bituminous is termed, is not much used by the Chinese. Bakers and smelters of silver prefer it for the greater heat which it emits. Anthracite or hard smokeless coal abounds in the mountains nearest Peking, the soft coal lies further back along with a superior form of hard coal called red coal from the colour of the ashes, and which gives out great heat and is very lasting. Several thousands of camels are engaged at Peking in the coal traffic during the cold months of the year. The summer being too hot and the wet season unsuitable for the camels' flat soles, these "ships of the desert" are despatched to the Mongolian plateau to graze during the summer. The coal is brought chiefly in the form of dust and small coal, which, being mixed with yellow earth or loess, found everywhere in North China, and water, is made into small balls. The method adopted in the preparation of these balls is the following. The coal is crushed into dust, mixed in certain proportions with the tenacious yellow earth (poor agriculturists make a living by bringing baskets of this earth into the city on wheel-

barrows) and water, the mass is allowed to soften and get saturated, is then spread evenly on a flat smooth hard piece of ground over which some dry coal-dust has been scattered; it is then cut into little squares after being sunned for some time; it is afterwards shaken up with a shovel, moved backwards and forwards in a large flat open wicker-work basket, which hangs from the ceiling; the swinging movement of the basket causes the squares to assume a round form; the non-adhering masses pass through the basket to be re-operated upon. The wet balls are then spread out to dry, for which one day is usually sufficient. They are then collected and stored away under cover for future use. They are sold at a price about a sixth cheaper than pure hard coal, while the quantities consumed in a given time are about the same. This is a very economical way of working up coal-dust which otherwise would be useless, or, if attempted to be burnt in domestic fireplaces, would pass unconsumed through the bars of the grate. It also renders the coal cheaper, and in this form great heat is emitted and the coal is thoroughly burnt, whereas much of the inferior sorts of anthracite would remain unburnt. Could much of our coalpit dust, refuse, and small coal not be manufactured in this way and used by the poor? The dug-out coal in China is quite superficial and therefore not of the best quality. This is owing to defective mining appliances. As soon as water collects in any considerable quantity the mines have to be abandoned and new ones opened, the cropping up of layers on the surface in the absence of all geological formation being the only indication of the existence of coal. The coal, though good, is inferior to that of the deeper, but to the Chinese inaccessible, strata. The Chinese plan consists in digging a hole at an angle in the side of a hill and continuing the working till it no longer pays to carry out the water on men's backs. Mines have lately begun to be worked on the Western model at two or three places in China by Western machinery and engineers. North China is so rich in both varieties of coal, that it may become in time the source of future supply to

exhausted coal countries. The hard, smokeless anthracite coal is burnt in stoves possessing a good draught. Were this coal to be burnt in our large towns, our fireplaces and furnaces being built for this sort of combustion, an enormous improvement would be effected in the heating of our houses and in the purity of the air of our cities, and the absence of smoke and fog. I need hardly say that fire-damp is a thing unknown in Chinese mines.

Owing to the use of anthracite instead of bituminous coal, and the absence of all noxious manufactures, the air in Chinese towns is always pure and clear, and the sun, except in rainy weather in summer, is always shining. The light and heat of the sun and the purity of the atmosphere are therefore important factors in the life of the people. The houses having no chimneys, there is no disfigurement to the landscape. Imagine how grotesque an ordinary modern chimney would look projecting from some old Grecian and Roman temple. In like manner the Chinese ideas of *feng shui* are utterly ignored by the erection by foreigners of hideous chimneys in most unæsthetic places. In the West the *dulce* has been obliged to give place to the *utile*. It is but rare to find both combined. In some countries the chimneys project at all angles, and present the most hideous contortions to the sky. In others, again, they are of moderate height and the flues are wisely united. The danger too from falling chimney-pots in high winds is not unimportant. There is room for great improvement in the number, height and position of chimneys. In the north of China the sun shines with a clearness and warmth for three-fourths of the year; and although in the winter the thermometer falls six or eight degrees below zero (F.) in the shade by day, it is pleasantly warm in the sunshine, provided a N.W. hurricane is not blowing. In London and other of our large cities the sun is not seen more than a few hours per week; and in some cases it is not seen for weeks. One would require to ascend the Alps to feel certain that the great luminary has not deserted our earth. The cloudless sky, the pure air, and the constantly dry bracing, invariable

atmosphere of the north of China are, as already remarked, all important features in the health of the Chinese and in the prevention of disease. It is this that makes Europeans fret at the inclement and variable skies of their native lands after a long sojourn in the East. Were the heavens as unpropitious to us as are the general surroundings of Chinese towns and streets, life would become a burden. Much of all this purity of atmosphere and constant sunshine could be secured if anthracite coal or gas could be adopted in our large towns for heating and cooking. The universal adoption of gas for these two purposes, if not also for light, although electricity seems destined to usurp the latter, would of course obviate the difficulty and create this consummation so devoutly to be wished! The smoke and consequent fogs in winter of our industrial centres are becoming intolerable; not only increasing our wash-bill and destroying our fine houses and architecture, but poisoning our lives and giving rise to a long train of maladies. Anthracite is found, I believe, in Wales, and if the supply there should be inadequate we can secure it from the United States or elsewhere. The changing of our fire-places in order to increase the draught is a small matter and of easy and cheap accomplishment. It need not destroy the open fire-grate, if sentiment is still to govern the heating of our rooms. Our transatlantic cousins have carried the construction of anthracite stoves to perfection. Necessity with them has been the mother of invention. These anthracite stoves are now so beautiful and comfortable, that they are a positive ornament to the room, instead of the yawning mouths of our fire-places which are suggestive of more funereal places. They can be lighted if desired from an outside room; they are quite free from dust; they burn all winter day and night without once requiring to be extinguished; the heat can be regulated, and by the free use of mica the glow of the grate is obtained. They are not subject to back draughts; they are safer against fire, they heat the room all equally, three fourths of the heat does not go up the chimney; they are self-feeding, the

heated coals in the cylinder assisting in warming the apartment, and they save an enormous amount of trouble and attention.

By the present method of generating heat it is said only 10 per cent. is gained and 90 per cent. goes up the chimney. This is even a larger proportion of waste heat than I had anticipated. We cannot go on vitiating our atmosphere in the generation of steam to the extent of 90 per cent. of heat. Some plan must be devised to produce steam without smoke and the necessity of long chimneys. It may be confidently reckoned that all plans having this object in view, like all methods for the amelioration of the people, would prove profitable. China would never submit to tall chimneys and so much smoke. They strongly object at present to house chimneys and high foreign structures, how much more to hideous factory stalks! Our fireplaces are at fault in causing the smoke and fog of our towns. The smoke is retained in a moist atmosphere, and returns on us as fog. The fog is dirty and wasteful, it injures health, disturbs business, destroys comfort. A change therefore in our mode of heating our houses would add greatly to comfort even if it only diminished the evils of fog. The defects of our present heating arrangements are too well known to require exposition here. The use of gas seems to hold out one solution of the evil. Gas is convenient, the heat is equable, its use will prove a saving of time; there need be no worry about the fire: the kitchen fire can be dispensed with altogether in summer; it emits no smoke, produces no ashes, and the cost will prove trifling compared with the more expensive and wasteful coal. Smoke abatement, it would seem, is only to be secured by resorting to the use of gas. Fog is matter in the wrong place as much as a weed or dirt is matter in the wrong place. There must be complete combustion in our grates. A writer lately on the smoke nuisance calculated that one million sterling per annum was thereby added to our washing bills; that the injury done to the Houses of Parliament amounted to

£2500 per year; that Westminster Abbey from a similar cause was in a state of rapid decay; and that it was almost impossible in London to grow flowers. If the effluent from our chimneys, sewers and drains were as innocuous as they ought to be, the effect on the death-rate would be most marked. The mortality in foggy weather in some of our large cities is said to be as great as it would have been during the prevalence of a heavy cholera epidemic. The cheapness of coal has produced carelessness in the use of it. We ought to aim not at the abatement of smoke, but at its ultimate extinction. Smoke abatement has been applied only to large factories, and hardly even there. Could similar regulations not be made applicable to private houses? In the interests of economy as well as health some such measure seems a necessity, and the sooner we set about it the better. We are bestirring ourselves about our underground sewers because dangerous gases therefrom permeate our dwellings and cause disease, while all the while the sewers above ground in all our rooms are polluting the air which we all breathe with their smoke and the products of decomposition and combustion. Our commerce, industries and manufactures should be the handmaids of health instead of, as at present, its enemies. We must cease to burn coal on the old principle; it is peculiarly wasteful, and it is well known that many valuable commodities can be obtained from it. Not only might our fuel be consumed for nothing to us, but we might realise a profit from it. We must not poison the air we breathe.

We have lately had an illustration of the expensiveness of fog in regard to the consumption of gas. During the twenty-four hours ending at midnight in London, Tuesday, January 20th, 96 million cubic feet of gas were sent out. To produce this amount of gas, 9500 tons of coal were carbonised. This amount was in excess of the corresponding day of last year, which is taken as an ordinary January day, of 37 per cent., or over 35 million cubic feet, which at 3*s.* per 1000 feet gives the sum of £5250 for the public to pay extra on account of fog to one London

company. Why all this waste of gas, coals and money? Fogs. as we have seen, are preventible. But apart from fogs, what an enormous and useless waste of gas takes place every night in our large cities in shops that ought to be shut, houses whose inmates ought long ago to have retired for the night, and on the public streets where it is not wanted. Imagine a city brilliantly illuminated and spending thousands of pounds in gas while its inhabitants are fast asleep! Could this money not be saved and given to the poor? Is the attraction of lighted streets not one of the crying evils of the times? How many pockets are emptied, how many firesides bared, how much immorality and intemperance engendered, how much health undermined, how many diseases produced, by all this evening glitter and glare? Why need our streets be illuminated all night? Should not all our people be in their beds by at least ten o'clock, and in their homes and houses three or four hours earlier? The police have their lamps for all necessary purposes, and doctors, the only other class of the community who have any call to be abroad during the night, have their carriages lighted. Our streets now are free from all dangers to pedestrians. Why, then, all this expensive illumination for the sake of any stray individual who may chance to be abroad? If our habits and mode of life were changed, as they ought to be, and must be if we are to reach and obtain the health we all desiderate, such new arrangements would not be thought strange nor felt irksome and burdensome. But if lights are really needed, a vast reduction in the number of our street lamps is possible after nine or ten o'clock in winter. If homes were made comfortable, there would be fewer incentives and inducements to go so much on the street, and be enticed into public-houses, music saloons, and other dens of iniquity. The public seem to spend a great deal of lighting for the benefit of such classes. Were it not that it looks like interfering with the private rights of individuals, the police ought to be at liberty to question anyone on the streets after certain hours. Our streets at night in our

large cities are often turned into a perfect pandemonium. Instead of spending our evenings as we do, productive of so much mischief of every description, would it not be more rational to get up betimes in the morning? When will the Anglo-Saxon learn the truth of his own well-known but little practised maxim, "Early to bed," &c.? Speaking of the vast and unnecessary night consumption of gas, I suppose there is as much spent in this way as would supply all the fire needful for heating and cooking in London and our large towns generally. Moreover, on the continent kerosine is now largely used in houses to which gas is supplied. This oil is now so cheap, good, and safe, and the lamps in which it is burned are so handsome and free from all danger, that it would be an economical measure for families to have recourse to its use. The introduction of gas was at the time of its discovery a great boon; now its place is well supplied with kerosine, and the future of electricity as a lighting medium is extremely hopeful. Many of the evils of which we have to complain in our present civilization would without gas have been rendered impossible; thus illustrating the common observation, of no good without much evil mixed up with it. Our highest wisdom lies in extracting the good and avoiding or minimizing the evil.

We are going through our coal at a fearfully rapid rate, and leaving the future to look after itself. After our coal is exhausted, our manufacturing interest, or at least our superiority, will, as far as we can at present see, be at an end, and we shall then require to go back to grazing and cereal growing, which should never have been abandoned to the extent we have done. More economical modes of burning coal, were it not so plentiful and cheap, would doubtless long ere this have been adopted in warming the household, instead of sending the great bulk of the heat up the chimney and bringing about unpleasant and injurious fogs and causing great expense. I see no reason why so much coal should be consumed in steamer use, and why the great bulk of the world's carrying should not, as formerly,

be sufficiently expedited by sailing vessels. The world's markets are overstocked by the rapid transportation of goods, and with failing markets this condition is not desirable. Mr. Teale, of Leeds, a well-known member of our profession, would save one-fourth of our coal consumption and provide better fires, at the same time reducing both smoke and soot by securing combustion at a higher temperature than usual and abolishing cinders. The contrivance is sufficiently simple, and consists of a shield of sheet iron placed between the lower bar of the grate and the hearth and fitting closely. If soft coal continue to be burnt, complete combustion grates must be constructed. That such grates will emit greater heat is evident, but whether the increased heat is to be utilized in warming the house, or still to be driven up the chimney, is not specified. I am rather sceptical as to such grates being more economical in spite of the term "economiser" applied to them. As unconsumed carbon is so much waste, complete combustion is at least more rational and advisable on other grounds than the mere addition of heat, supposing such heat to be made serviceable for family use. Moreover, soft coal cannot be economically burned in cylinder stoves or grates having too great a draught, as for example, under the continued influence of a blower. Bituminous coal burns naturally so easily that less draught would appear to be essential to prevent its too rapid combustion. Complete combustion disposes of the question of soot, and this in itself would be a great gain. Greater heat is the consequence, but whether all this advantage accrues to the family with proportionate reduction in the amount of fuel, is not yet clear to my mind. The so-called "economiser" shuts off the cold draught from underneath the fire and preserves a heated chamber under the fire, which in the chamberless grates is said to be filled up with firebrick. This firebrick meets some of the same conditions, but is inferior to the heated chamber. Chinese stoves have no such principle. The k'ang stove is embedded in the earth and receives its draught through the ashpit in front covered

with boards. The draught is sufficient to burn hard coal. Below the bars there is an open chamber. Half way up the stove is a small hole for draught and for convenience of stirring the fire.

The object of all heating is to keep an even temperature, and prevent the rapid cooling of the skin and heat diminution of the body, which freezes the life processes and rouses the unpleasant feeling of frigidity. We freeze more in a cold room than in a similar cold free air, because we can move about in the latter. Over-heating tends to the weakening of the mucous membrane of the air passages and disposes to catarrh, &c. ; and when the air is at the same time moist as when the fire is likewise used for cooking, the putrid and decomposing processes are set up, and then infectious diseases find an extremely favourable ground. Over-heating is also disadvantageous on account of the diminution of the evaporation of water from the skin and the abduction and dispersion of the heat of the body (important processes in the economy of man's body and for the exchange of materials), and thus weakening of the organism and impairment of its power of resistance is produced. From all these evils the Chinese system frees us. How admirably suited the Chinese dress and heating of their houses to suit these healthy conditions ! Foreigners require fire in their houses when the Chinese do without them, consequently the former feel the cold more than the latter when out of doors. The foreigner lives too artificially comfortable. The Chinese trust more to dress for keeping themselves warm than we do, and they are less liable to catch a chill in a fireless or draughty house.

Mode of Lighting.

The windows are the lungs of the house. Of the four walls of Chinese houses two may be said to be entirely made up of door and windows. The windows thus occupy the whole of the front and back sides of the house. They admit, therefore, plenty of light and a considerable

amount also of heat. They are made, like the Scotch window system, into upper and lower sashes, but do not, like them, slide upwards and downwards. The upper lifts to a right angle or any intermediate position, the lower takes out altogether. In warm weather the upper can be raised. In the lower a pane of glass, large or small, exists which lends a cheerfulness to the room and enables the occupants to look out upon the garden, courtyard, or flowers upon the window-sill. In summer the window frames are denuded of the paper with which they are covered, and have thin open gauze stretched over them. In the better houses a gauze frame exists inside, and in windy or cool weather the outer shutter of paper is let down. Where no outer shutter exists, there are paper blinds, which roll up or down, to uncover or cover the gauze as desired. The door is made in the same way as the window. The poorer houses have only a "wind" door (*fĕng mĕn*), which in its upper part is, like the window, of open work, the lower part being of boards. The better houses have more substantial doors inside of a similar description, and an outer "wind" door. During the day and in warm weather the "wind" door alone is used. In still warmer weather screens of bamboo are employed in place of doors, to keep the house cool and shut out winds. The Chinese doors and windows admit, therefore, much light, and light of a soft, agreeable nature. The windows and doors are papered with Corean, rice or common white paper, the first variety being made from woody fibres, and very strong. The heat admitted is also not unimportant. In winter both are needed; in summer both in excess are avoided by the use of verandahs, mats, and awnings. The sun is high in summer, and the thick roofs and overhanging eaves ward off the sun's rays; the roofs are frequently also under mat coverings. In winter, when the sun is low, the awnings and mats are removed, and the verandahs do not obstruct his rays.

It will be noted, therefore, that all the windows of a Chinese main house facing the south are on the north and

south. The doors of such houses are invariably on the south. The windows and doors occupy the whole of the south frontage, extending from roof to floor, except the low wall, which forms the sill of the window, and against which is placed the back of the bed platform. The same relation exists with regard to the east and west side houses and all the other houses of a Chinese compound. All the windows or doors of the front of the house being of the same construction, the distinction is one more of use than of difference of formation. The entire front is papered. Glass has lately come into use among the upper classes, who insert one large pane in the centre of each lower sash. A Chinese window in the better houses usually consists of four sashes, two upper and two lower; in the common houses, of two sashes. The poorer people insert a few pieces of glass in the openings of the door or window. On the north side of the house large windows exist, but not so frequently filling up the entire space. In winter these windows are commonly shut up, and in summer opened for ventilation. The back verandah being taken into the house, the back windows have rain shades attached to them, the eaves being insufficient to protect against rain with wind. By the use of these outside shutters and inside gauze frames, the Chinese better houses may be said to have double windows. It is a wonder that double windows have not been more adopted in our cold climate, as in some parts of the continent where the winter weather is not so trying. They equalize the heat of the room, the air between the two windows being a bad conductor of heat. They thus retain a little more of the genial warmth from our wastefully constructed open fire-places. The Chinese bamboo blinds take the place of the Venetian blinds in Europe; their mats and awnings the marquises of the West, and their pavilions the gardens of Europe.

So much for the natural light of the house. The artificial lighting of Chinese houses consists of candles among the higher classes, and oil lamps with wicks among the lower classes. These oil lamps are not unlike those

found in use among the Etruscans. The common lamp is made of earthenware, and has a wick of pith lying in oil, with a nail run through the hole of the *cash* (Chinese copper money) to press down the wick in the oil and keep a small portion out of the oil projecting from the edge of the saucer containing the oil. Kerosine (called stinking or coal oil) is fast coming into extensive use, but without funnels the light cannot be raised without smoking. Even as it is, the kerosine emits a better and cheaper light than the native oil or candles. The oil usually burnt is the sesame oil. The better class of candles is red, the joyful colour. These candles are peculiarly made. Candles made from the tallow of the so-called tallow tree have an outer and variously coloured coating of wax, which gives hardness to the surface, and so prevents the running of the heated tallow, forming a cup for the melted tallow. The large thick rush or reed wound round with cotton, which burns as well as those made of cotton alone, requires a large supply of liquid oil ready to be absorbed. The Chinese have consequently never dreamt of preparing a substance of sufficient consistence to supply the wick and at the same time prevent the running over of the melting oil. Small oil lamps covered by an upset tumbler without a bottom is used by opium smokers. The object aimed at here is a steady and protected flame. Besides the sesame oil, hemp and cotton seed, castor and tea oil, are used not only for illuminating, but also for lubricating machinery, painting, &c. Castor oil cooked loses its well-known property and is used for food.

It is evident that Chinese houses do not fail in the matter of light. This is an essential of house construction to which we have not yet attained. Perhaps our climate and tenement houses do not permit of such an expanse of window. Beside a Chinese house even of the poorer sort our best windows look almost like pigeon-holes. The dying words of Goethe, "Mehr Licht," ought to be the cry of humanity in these islands. Now that the window tax is repealed there is no excuse for dark houses. We are all

for ventilation; there is no cry for more light and heat. Dark gloomy houses are always unhealthy, ill-aired, and dirty. How many diseases are to be attributed to the want of sufficient light. We see what deprivation of light does to vegetable life. It is equally injurious to animal being. Solar light is the great arrester of infusorial life. How much do our Western houses exclude the light of heaven; how many rooms with hardly a window at all, and how many open on shut-up courts and never see the sun at all. The Chinese rooms all receive the sun—there are no back rooms. Rooms invariably occupy the whole breadth of the house, and hence it is quite common to find rooms of great length with half the breadth. At Peking the best rooms are about thirty by fifteen feet. Partitions in south facing houses run north and south, never east and west. In side houses always east and west, never north and south. To gain this desirable object—sunlight and proper ventilation into the bargain—it would be advisable to build houses the breadth of one large room only.

VENTILATION.

Ventilation most probably will be denied to Chinese houses. As lighting and heating go hand in hand, so also do lighting and ventilation. Two whole sides of most houses, and always one side and one small window high up on the back side of poorer houses, are composed of a framework with gauze in summer and paper of various qualities and degrees of thickness stretched or pasted over it in winter. There is no question of ventilation in summer, doors and windows being thrown open all day long, and the inmates protected from flies, mosquitoes, *et hoc genus omne*, by gauze or bamboo screens. The Corean paper, thick though it be, has its thin places. The others are thin, very porous, and fragile. Holes naturally form in the paper; house quadrupeds and bipeds "make solutions of continuity" in the paper of the windows and doors. Holes are purposely made at the top of the paper windows before and behind, to

prevent asphyxiation from the open charcoal and anthracite fires generating CO_2; the wind-doors are bought ready-made, and, like a Chinaman's clothes, never made to measure, would suit almost any opening. Holes are constantly being made also by crows, sparrows, hornets, and other insects, not omitting the domestic cat. These all declare that ventilation, although not scientifically attended to, is yet observed, and its practical value understood in winter. Then, again, in the best houses, the ceilings are much higher than in Europe. The poor people are certainly anxious to lower theirs as much as possible, to lessen the amount of air to be heated, and to keep in the warm, heated stove air. If the Chinese were to adopt our tight-fitting doors and windows, substituting glass for paper, and still adhere to their open stoves, the results would be disastrous. I have known one or two cases of asphyxia of this sort. The Chinese houses being destitute of chimneys, the ventilation is carried on by means of the doors and windows. The bottoms of the wooden pillars upon which the roof rests and the k'angs are ventilated from the outside. A large amount of air is admitted under the eaves between the joists of the roof, although plaster is here applied to keep out the cold air as much as possible. The frequent birds' nests in these holes and the numerous holes in the ceiling caused by rats set up circulation of air in this direction. The burrows of rats in the floors, k'angs, and walls also promote the circulation of air. The chimneyless stoves tend, as already remarked, to the speedy blackening of the paper of the house. The practice of renewing them, on the windows at least, every autumn and replacing them by gauze every spring, gives a lightness, cheerfulness. and freshness to the dwelling, which otherwise would soon become gloomy, dark, and repulsive. In summer the ventilation is necessarily perfect, owing to the warmth of the weather. The doors and windows of the poor people are bare, and Morpheus is frequently wooed on the verandah or courtyard under the canopy of heaven. In China all ventilation is natural, none artificial.

A long list of diseases are enumerated which are said to be caused by vitiated air, viz., consumption, anæmia, failure of appetite, scrofula, colds, rachitis, disposition to disease, and the foundation of later diseases laid in childhood, as for example, scrofulous glands in adults. In proof of this we are referred to the diminished mortality in some new prisons as compared with the old. That there is great need for free ventilation is witnessed to by the amount of CO_2 thrown off by the lungs in breathing, by the consumption of gas (and it is calculated that a gas flame develops hourly about 200 *litres* of carbonic acid gas), and other substances not yet known to chemistry which are contained in the air of our rooms. The Chinese have not yet adopted gas. It is these products of respiration and matters thrown off by the skin which are found wherever a large number of people are crowded into a small space, or few individuals for a long time without ventilation, and give the peculiarly disagreeable smell. Persons in such circumstances are not unfrequently attacked with unwellness, giddiness, fainting, &c., symptoms produced by vitiated air. After a time persons become less sensible to foul air, although on first admission they were extremely sensitive, which teaches us that our senses give us no correct notion of the gradually increasing adulteration of the air ; and therefore, in small or overcrowded rooms, if there be not a regular ventilation, we are exposed, unknown to ourselves, to the continuous working of poisonous substances. It is somewhat remarkable, however, that we are more susceptible through our nervous sensations to the necessity of warmth than to the necessity of pure air. Chinese experience would seem to indicate that comparatively impure warm air is less injurious than absolutely cold pure air. Scrofula, rheumatism, catarrh, chills, bronchitis, and diseases generally of the respiratory organs are much less common among the Chinese than among Europeans. In the West, deficient ventilation is supposed to be the most fatal of all conditions affecting life.

Although the Chinese stoves are chimneyless and do not

therefore aid ventilation, but largely increase the products of combustion and add to the vitiation of the air, we have shown that ventilation does however exist. The porosity of the walls, so-called natural ventilation, of Western houses is supposed largely to influence ventilation. Pettenkofer has proved the permeability of our walls to air and gas. Our breathing, and the heating and lighting of our houses, is continually using up oxygen and producing carbonic acid gas, and on account of the cold and for economic reasons, ventilation in winter is imperfectly attended to by opening doors and windows. In these circumstances our porous walls are said to do some service by drawing away some of the devitalised air of our rooms and allowing oxygen to enter. Bricks in this respect are said to be excellent. This interchange of gases between the inside and outside is continually going on more or less whatever be the materials used in the construction and plastering and papering or painting of the walls. Chinese houses being built entirely of very porous bricks, are more porous than stone, and the Chinese plastering and papering is also much more porous than the same material in the West. Painting, which is a greater hindrance to this transfusion of gases than any other substance, is not had recourse to in China. Much, too, of the Chinese walls, particularly the whole brick portion at the bottom, is not much plastered. But in spite of this porosity and the great expanse of paper, window and door, and numerous chinks allowing outside air to enter, and breathed air to obtain egress, we unfortunately, with the open stove or bed platform stove burning coal or charcoal in winter, and particularly where several people are huddled together, find asphyxiation at Peking not uncommon. Ventilation through walls, therefore, can count for little under such circumstances.

Streets.

It is impossible to leave out reference to the streets while discussing the question of houses. The streets have so much to do with healthy dwellings that the two things

cannot be disassociated. In Peking the great streets are unusually broad and straight and run generally from north to south. The lanes, which would in other Chinese towns be deemed respectable streets, run as a rule from east to west. The streets, excepting where they pass through the city gates, are unpaved and even unmacadamized, and have no side footpaths. A few stone roads exist outside Peking for grain transport, Imperial use to parks and palaces. These roads, made with huge granite stones are now in such a state of decay that all vehicles seek the earth road on each side, or form detours to escape them. The paving of cities and courtyards in the West has been rendered necessary by the exigencies of our modern civilization and the health and comfort of the people. In relation to health and the deodorizing and disinfectant properties of the soil, have we not lost a useful agent in covering up the face of the earth with pavement which is much less porous than the native virgin earth? It is evident we cannot go back to country roads in our large towns. Is the health of the country and country towns to any extent favourably affected by mother earth? Is pure undefiled earth not a great purifier? Or is this comfortable belief in which we have so long lived to be swept away by the disagreeable facts brought to light by modern science? Does Moule's earth-closest system not owe its efficacy to the employment of earth? Is the advantage claimed for Mohammedan or wicker basket interment not owing to the direct consignment of earth to earth? Do germs of infection which have been disinterred after years of consignment to the ground and found not to have lost a whit of their virulence, owe their vitality to the mode of interment? Some other mode of disposing or destroying of the body seems necessary if the germs of desease are to be stamped out. The telluric smell as fresh earth is turned up by the plough, or as it is felt on the approach of rain after a few months' drought as. at Peking, is considered healthy.

The streets of Peking are formed of earth, mixed with centuries of the filth of the city, and although underneath

there is a stratum of yellow loess, the surface is dirty in the extreme. This upper layer, consisting, as it chiefly does, of the ashes of the houses, is very porous, and largely disinfectant and deodorant. After rain the streets dry quickly. In wet weather they become very muddy. In dry weather they are very dusty, and in windy weather this dust is blown about and finds ingress everywhere. The value of this soil will be apparent when our further insanitary surroundings at Peking are described.

The streets are broad, permitting of the free circulation of air and the dilution of noxious vapours, thus rendering them harmless. The dangers arising from collections of decaying organic matter are obviated by the action of the oxygen of the air. Winds blow frequently and freely through Peking and other Chinese towns, the air is being constantly oxygenised and the putrescent matters it contains being destroyed. It is the concentration of gases, shut up in dark drains, upon which the sun never shines and the winds of heaven never blow, that is to be feared, and which renders them dangerous, causing them to pass through the porous walls of the sewers, permeating the soil and entering our houses, either directly through the soil pipes, or indirectly through the subsoil of our dwellings, scattering disease broadcast. If these drains were exposed to the light and air, they would be unpleasant to the sense of sight and smell, but might prove less harmful to health.

The streets at Peking are so broad that in the busy thoroughfares, where business and convenience render concentration of wares advisable, a double row of booths exist, thus forming, as it were, three streets out of each thoroughfare. Some of these booths are more or less permanent, others temporary. They are erected with the permission of the police, to whom a sum of money is paid. They render the appearance of the otherwise fine streets somewhat poor in appearance, and form nuclei for the collection of filth and every sort of abomination. Should the Imperial cortège pass any of these streets, the booths lining the route of procession are of course pulled down,

to be rebuilt as soon as the Emperor returns to the palace. As the Emperor seldom leaves the precincts of the palace, and the route is limited to a few streets, the occasional demolition of these structures does not prove a great hardship to the owners.

But not only the booths, but the mode of repair of the streets divides them into three parts, an elevated centre and two lower side roads. The central thoroughfare is raised and kept in repair by digging the earth from the two sides, thus forming the two lower roads which subserve several useful purposes. The drains of the streets being impervious, some arrangement was necessary to prevent the shops and central part being flooded in the wet season. The two lower portions answer this object admirably, and their convenience to this end is further increased by the digging of deeper portions close to the central part which form reservoirs for the rain, thus relieving the lower portions and rendering them also suitable for vehicular or pedestrian traffic when the central part is under repair. The earth and rubbish from these ditches permit of the central cart-way being easily and cheaply repaired, and from the water which they contain in summer the elevated part is daily watered. These ditches are also to a large extent the latrines of the city. In the winter they are for the most part dry. Through the constant wear of the streets, the winds that prevail and their being the reservoirs for the dirt of the houses adjoining the streets, they gradually fill up and are regularly dug out. All the rubbish from houses, ashes, housebuilding, &c., are thrown on the thoroughfare. In this way the roads have in some places become unusually high ; in other places, in accordance with the inclination of the surface and the flow of the water, they have become much sunk. These low parts in the wet season are quite under water, including the central and side roads and shops. In these circumstances all locomotion is at a standstill. Millet stalks are put up on each side of the elevated portion to guide the travellers and carters through the abyss of waters,

but even with this assistance, the capsizing of carts and the drowning of animals and citizens are not unknown. The mud sides of the central portion give way, and the available ground beyond permitting two carts with long axletrees to pass is so limited that hardly single file is possible without being struck by the axletree or precipitated into the ditch. Poor people stand in times of deluge at the corners of streets to carry passengers for a trifle across the mouths of lanes or over expanses of water. These stagnant pools of water soon assume a greenish covering and bubbles of gas are continually being generated, and the beautiful dragon fly is constantly skimming over them with his outstretched gossamer wings, pursued by boys and men with nets and a tuft of cotton wool, who exult in their capture.

The streets are regularly watered every afternoon before sunset, and at other times when the dust is violently blown by the wind. The time of this watering by hand buckets is late enough to allow the officials to have returned from their offices and to prevent evaporation by the heat of the sun, thus permitting the soil to absorb all the water. During the night and next morning the streets are in fair condition for walking, riding, and driving, but by the afternoon dust again prevails. This watering in most cases consists, in winter, of water from the wells or their adjoining waste water reservoirs, but very often from drains that have remained pervious in part, or been dug out in the spring with this object for the convenience of the police or to deceive the officials, money being paid out yearly from the Imperial exchequer for the cleaning of the sewers. The dirty water from the shops on the streets is also thus disposed of; being thrown into the ditches or supplied to the police for the main roadway (the side-ways are never watered) or utilized by the shopkeepers themselves (which is often the case) in watering the side-paths immediately before their own doors.

The streets are never swept. The shopkeepers occasionally sweep before their own doors, which results simply in a change of position of the dirt. In the very muddy

condition of the streets in summer, when all vehicular movement is impeded, and there is no chance of a bright sun and strong wind of bringing the roads into a passable condition for many days, the police collect the mud on the sides of the roads, so as to expose the dry bottom, and then as the mud dries it is again spread on the streets.

Although the streets are never swept, there is an amount of scavenging done which is important. It has been said that the streets are the public latrines of the city for the shopkeeping class, and for the large numbers that live on the street, and they are also the public receptacles for all manner of garbage and refuse from the houses. No municipal control is exercised over the cleansing of the streets. The police authorities take charge simply of lighting, drainage and repairs, and how ineffectively these are done will be apparent from our remarks. Public scavenging is done by private individuals who find it pays to collect the products of the streets. In our country there exists no class perhaps so poor as would care to earn, even if possible, such a livelihood for themselves and their families. On account of the value, however, of these various articles of refuse, a variety of trades subsist. Human excrement is so valuable a manure, that a large class of persons is engaged in collecting it on the streets during the evening or early in the morning. They carry a deep bucket slung over their left shoulder, with a large iron round concave spoon attached to a long handle in the right hand. They visit the private houses for the same purpose. They transport the collected matter to the manure drying and caking floors which exist chiefly outside the city, although some are also to be found within the walls. It is first spread out in layers, and after a certain amount of inspissation it is made into cakes, and still further sun-dried, and afterwards gathered into mounds ready to be sold, and largely used for manuring purposes. It is the most costly and valuable of all manures. Its collection and drying employ a large staff in China. So valuable is it esteemed, that they clean out private privies, empty and wash night pails, and sweep

water-closets free of charge, simply for the ordure. It is only when greater regularity and cleanliness, respectability, honesty and responsibility is desired, that a small monthly sum is paid, not amounting (to foreigners) to more than six or eight pence.

Another class finds occupation in collecting horse, mule, donkey, and camel manure, which is broken up and sun-dried for fuel. Floors where this is carried on exist both inside and outside the walls. In Mongolia the chief fuel consumed is of this description and called argols. A third class collects paper and rags. They carry a wide wicker basket over their shoulder, and in their right hand a small switch with a bent pin at the end, with which they prick the articles in question, and swoop them into their baskets. They are conveyed to rag and paper stores, where they are sorted, and the produce sold to paper manufacturers. Paper with Chinese characters upon it is considered sacred, and this with hair is usually disposed of by sticking into holes in walls or houses. The women collect their paper, rags, and old shoes with which to purchase bandoline or other articles used in the female toilette. Another class collects straw, chips of wood, cinders, unburnt coal for home consumption. They carry a little basket over their arm with a piece of wood which is used to break up the coal balls to see whether they are entirely burnt. Poor children and old women constitute a large proportion of this class. A healthy competition exists in some of these callings. The collectors of ordure have rivals in pigs and dogs which abound on the streets. Beggars dispute with pigs or pig owners for all sorts of vegetable refuse, cabbage, cucumbers, melons, and the like. The country agriculturists form another class of scavengers, who bringing into the city burnt tiles, bricks or straw, instead of returning empty, fill their carts with the rich loam of the streets which collects in the ditches or elsewhere where refuse is thrown out, and this is used for enriching the land. As this process tends to the lowering of the streets, the practice is forbidden by the police, but nevertheless the trade is carried

on briskly, a small fee to the city gatekeepers sufficing to pass these barriers. These carters take a spadeful here and there passing along until their carts are full. This trade is carried on in the winter months only, when the roads are good, the agriculturists at liberty, and the time when the yearly supplies of building material and horse fodder are brought into the city from the surrounding country. In spite, however, of all this private scavenging, the streets are not clean, because no class prosecutes the calling for the sake of street hygiene.

There is yet another class that gains a livelihood on the streets, and this comprises the iron collectors. The men of this class have basket dustpans, with an old straw brush, with which they sweep up the dust of the street, and by a process of winnowing they get rid of all the dust, leaving behind small pieces of iron, nails, &c. Ducks are sometimes reared in the pools on the streets, and the water in the ditches in the summer is often skimmed by men with gauze bags, whose object is to collect the animalculæ they contain, with which to feed gold fish. Others with lanterns at night peregrinate the streets, searching the base of musty old walls in summer for scorpions and centipedes, to supply the druggists, who make use of these animals in compounding medicines both for internal and external administration. Among other disgusting things entering into the Chinese pharmacopœia, we may mention in this connection the use of human excrement as an effective emetic. We cannot stop to speak of holes dug in the streets, from which to extract the yellow earth for coal ball making by poor families who cannot afford to buy it, nor of the earth and mud of the streets used for building purposes, &c. Dogs, crows (both of which abound at Peking), and buzzards devour what animal matter is thrown on to the streets, in the shape of dead cats, rats, &c., and the beggars seize dead dogs and carry them off for the sake of their fur, if not their flesh.

Compare the above with the collection and disposal of street refuse in Western towns. The quantity of matter

to be found on the streets of large cities of Europe, clean though they be, and the dirtiest of them much cleaner than the cleanest Chinese town, is remarkable. There is enough of paper and horse-dung to keep a whole army of poor people employed in collecting and selling it. The quantity of paper burnt recklessly, too, is prodigious. I have seen the dust-carts of many European cities filled daily with paper, pasteboard, bandboxes, &c., to an enormous extent. I have even found in the streets and staircases large quantities of good bread which might feed many poor mouths of either men or domestic animals. For very much less I have seen poor Arabs follow ships for miles along the banks of the Suez Canal, and swim into the water to obtain it. There is indeed much waste, and waste of much material which in China would be turned to valuable account. Must we import Chinese to teach our poor how to live? Must we bring the Chinese to teach our municipal authorities how to scavenge our streets and how to utilize street refuse? Such a collection of paper and rags could surely be made to pay. The amount of cinders and small unburnt coal from the kitchen refuse would warm many a house, and cook many a meal, and everything else in the same proportion could be turned to valuable account. I have heard of persons in good position in London collecting paper at home and receiving twelve shillings per large sack. If poor people attended at the railway goods depots or wharves, or wherever rubbish is thrown, or is conveyed to be discharged into the sea, or deposited as manure on the land, or burnt or otherwise manipulated, a plentiful harvest might be gathered without trouble and expense, which could be turned to good account. Such refuse gatherers exist in some of our large cities, but even after they have collected what they desire, an army of poor Chinese coming after them would still find remunerative refuse to collect. This remainder is more than the original amount found at any time in a Chinese town, for there are not only poor scavengers outside on the streets, but thrifty careful people inside, who

turn every rag or piece of paper to account. So much so is this the case, that well-to-do shopkeepers and private householders send their servants and employés to the street to pick up all unburnt coal from the ashes which they throw out. But even after such economy, careful gleaners are able to make it worth their while to re-inspect the ash-heap. The practice is beginning largely to obtain in England of burning the street refuse in those so-called "refuse destructors." So much organic matter exists in the street sweepings and kitchen garbage, as to burn up the refuse without being at the expense of coal. We shall here add what we have to say regarding Chinese streets before passing on to the discussion of the drains and sanitation generally.

The streets are entirely free from those social pests which infest nearly all Western cities. In fact Chinese streets are entirely deserted at an early hour. They are badly lighted with straggling oil lamps, the shops are closed, the city gates are shut, and certainly there is no attraction outside. The oil lamps are saucers of oil with wicks placed in wooden frames glazed with paper, representing the colour of the banner, and standing on wooden stands. The plan adopted in Europe of suspending lamps from the two sides of the streets has never been thought of.

Police are provided for day and night service. The city is divided into districts, according to the eight banners of the Manchus, each banner being assigned a district: police stations exist in each district, and the under police have quarters adjoining, or they occupy little houses built on the street where they spend their time at night, chiefly in opium smoking, putting in an appearance only when their officers go their rounds. The real police employ a set of beggars to go round at night beating on a hollow piece of wood and indicating the different watches of the night. The noise they make is a sure warning to the thieves of their approach. For the greater safety of the inhabitants, each end of the lanes has been furnished with gates, which were made to be closed at night and opened in the morn-

ing. They have been allowed to fall into decay and now no longer serve their original purpose, but rather prove stepping-stones for thieves to the roofs of the adjoining houses, and from them they readily reach other houses. Large houses and shops have watchmen of their own who go about all night beating their hollow piece of wood.

For the convenience of the inhabitants there are hawkers and small tradesmen who traverse the streets and lanes all day, those selling condiments, bread, &c., far into the night for the sake of the opium smokers, crying out their wares, each trade having a different cry or sound, either natural or mechanical, by which their business is known. In this way a host of small merchants find employment, and the people can buy almost everything at their own door.

The streets are everywhere plentifully supplied with carts for the convenience of passengers. The fares are very cheap. The passenger invariably bargains for his fare before entering them—a most wise and necessary precaution, even in spite of the remarkably low fares demanded. The people will higgle with the carters while they pursue their journey onwards, the carter and his would-be fare disputing about a tenth of a penny. The carters pay this amount to the district police for the liberty of placing their carts on the stand. If they move away without a fare they do not require to pay the police. Many carters on regular stands compound with the police for so much a month. The carts all drive slowly, and due regard must ever be paid to pedestrians on the street. It is the duty of the carts to stop for the people, and not that of pedestrians for the carts. If by any chance life or limb should be endangered, the carter in every case is held responsible, and he is not allowed to move from the spot until full justice has been done by a money penalty, or, if the affair be trifling, by an ample apology. His vehicle and animal are usually seized or consigned to the care of the police, while he himself is taken to the house of the injured person, for whose welfare he is responsible. He is only released on finding suitable security, and undertaking

the entire responsibility of the life or death or permanent injury of the individual who has sustained the accident. This practice works well, and perhaps in Peking there may not be a single death per annum from street accidents. Compare this with London, where furious and wanton driving causing bodily harm is not uncommon. There is perhaps, hardly a day in the great metropolis when some street accident, occasioned by criminal recklessness in driving, does not occur. It is a criminal offence, and a necessary and salutary law, but how reluctant juries are to convict of the offence ; the Peking plan would put an effectual stop to it. Travellers ought to allow themselves more time to perform their journey or catch their train. Quick driving is often resorted to for the pleasure of driving fast where expedition is no object. I have observed lately in London the care which the police exercise in stopping all traffic to allow the accumulating pedestrians to cross over. This has been often warmly commented upon by foreigners in contrast to the practice in their own capitals. Subways at some of the busier crossings would be a decided advantage for delicate and nervous individuals. But once you do start to cross a London street it is the height of wisdom to go ahead. The only quick driving in Peking is of eunuchs in horse-carts. The people use mules in their waggons ; it is not considered respectable to drive in a horse- or donkey-cart. Such, however, are to be had in abundance. The politeness which reigns among the carters, and which is characteristic of the Chinese generally, is worth noticing in passing, for they are as far ahead of the French, as they are behind the Japanese in this quality. Every cart-driver descends from the shaft of his vehicle, Jehu's seat, on meeting an acquaintance or superior. This courtesy makes life move along smoothly and pleasantly. At night should carts by any means require to be out after dark in the street, they are obliged to carry a lantern tied to the shaft on the right side, i.e., the side adjoining the opposite track. So also with pedestrians ; on account of the numerous ditches and open sewers, it is necessary to carry a lantern.

Drains.

The streets of the capital were originally laid out with double drains, one on each side of the main streets, and one in each lane. These drains are large, deep and broad, and were substantially built of large brick covered by granite flags, when Peking was laid out by Yung-lo, the third Emperor of the Ming dynasty, about 500 years ago. They have long been blocked up with the mud and dust of the streets, a danger to which they are always exposed, by reason of the sandy soil, the prevailing winds, and the surface water which carries large quantities into them They are opened in part each spring in different places, and cleaned out for a distance of a few feet in both directions, to satisfy the demands of the authorities and the receipt of Imperial money received for the purpose. They are left open for some time endangering pedestrians and making it very offensive. Frequently they are never filled up, and thus allowed to fall into complete decay. They are broken down in many places ; the surface water runs in at one point, flows out at another, and after meandering along the street, forming pools in its course, it re-enters the drain. The main streets are generally now much below their original level ; the lanes are generally much higher, and consequently we find the drains at a considerable depth in the latter, and frequently high, dry, and exposed in the former. This system of surface drainage, which at the time it was planned was probably the most perfect in existence, is now, like everything Chinese, allowed to fall into ruins. These drains carried all the rain water into the city moat, which flowed thence into a neighbouring stream. The exigencies of geomancy have almost invariably compelled the building of cities at or near water courses, the rivers or canals being employed to beautify the city, provide communication for the transport and storage of grain, rice, &c., and in winter to supply ice. The better houses have likewise a surface drainage, the system of courts of which Chinese houses consist, being so con-

structed that the water flows from one court into another, and thence into a drain which connects with the street drains. This arrangement prevents the houses being flooded when the rain, as in summer, comes down heavily. As the main drains are now impervious, the courts of private houses are frequently flooded. This is partly obviated by the lower courtyards being considerably below the level of the houses, thus providing a reservoir for a large rainfall. Impervious though these drains be, it is astonishing how rapidly the water disappears, even after complete saturation. There are no drains inside the houses whatever. The surface water of the courtyards during rain runs off by small drains into the main surface drains of the streets. Every house or courtyard has its drain connected with these main drains. The courtyards drain into each other, and the lowest into a drain connected with the main drain. These drains were designed for the rain water. Many of the shop-keeping class have sinks outside their houses, in the corners of their courtyards, and some exist on the street, which are connected with the drains. When slop water is not needed for watering the streets, it is emptied into one of the neighbouring drain openings, or more frequently into the street ditches. When a side of the street with an impervious drain is inundated with water, a drain is dug across the street by public subscription in the locality to allow the water to flow into the drain of the opposite side. The police try, if possible, to keep one of the main drains pervious. The drains being so large allow a large quantity of refuse to be deposited in them, and yet remain serviceable. The surface drainage in the country is allowed to run as the surface of the earth allows. The roads become the watercourses in summer when all heavy traffic is at a standstill. There are always footpaths suitable for animals and men, and it is on the backs of these that most of the trade of the country is carried on. The water lies in the roads until it is absorbed or gets evaporated; or it percolates through the soil, and, emerging at some other point, joins a river, or

forms a lake. Such are the general surface drainage arrangements in China.

There is the entire absence of water-closets in Chinese houses. Privies exist in the corner of the courtyard of the small houses, and in a distinct side or back court in the better houses. These privies consist of one or more holes a foot or two long, half a foot broad, and two feet deep. There are two large bricks on each side, and no seats. All the public privies with us, such as at railway stations, on the streets or elsewhere, should for purposes of cleanliness be made without closed seats. They are never put to the use to which they were intended. The better made ones have a suitably placed receptacle for receiving the urine which may find its way to the street drain, the hole itself lower down, or percolate into the soil. On the public streets are latrines of this description for the shop-keeping class, and those without these conveniences in their own compounds. As already remarked, the sides of the public streets after dark are much frequented by the same class. Any long disused, or unoccupied dwelling, or ruinous building, is generally appropriated to this object. In the interests of decency and morality, one could wish that this nuisance did not exist on the streets of a great city. In the country, privies are erected at the two ends of a village, and enclosed by millet stalks for the use of the male inhabitants. The women, in crowded towns where no courtyard is available, use the pail system. In the country they use the invariable hole in the earth. These privies for the most part are quite open, or have the simplest covering of reeds or millet stalks as a protection in bad weather. The pail-system works well. The contents are emptied daily and the vessels washed. The pits are also daily cleaned. The excreta are collected and carried into the country to be used as manure. Except the ditches before mentioned on the streets, or in some places of the moats of the cities outside the gates, no cess-pools exist in China.

To the Chinese the idea of water-closets inside the house

is simply revolting. Their notions of decency, propriety, cleanliness, and the eternal fitness and harmony of things, would thereby be grievously insulted. Their general guiding principle would not, however, be the danger of causing and spreading disease, or its manifest convenience, nor even of the necessity of restoring to earth what has been taken from it, but simply a question of utility and economy. The people would deplore the irrevocable loss of so much valuable "native guano" (as it is very properly termed by us in view of the enormous sums annually paid for Peruvian, while we were, and still are, throwing away a much more valuable and extensive manure), which might have been utilized as manure for crops upon which the life of man depends.

The exigencies of our large towns, our flats of houses, our limited court and garden ground, in short the demands of our civilization, have driven us to adopt what at first sight seems to be the most convenient system. The contamination of our rivers, destruction of our fish and the loss of a most valuable manure, &c., must not of course enter into our calculation. All these factors, important though they be, must give place to that of health, and if it can be proved that the water-carriage system is the healthiest, the question is practically settled. We think there is good ground, however, for doubting even this supposed benefit. The various processes that have been originated and applied to the disposal of sewage have had reference in the first place rather to the utilization of the sewage matters, and for economic reasons, and particularly in towns not well situated in regard to water-carriage rather than with health objects. Where water-carriage has existed, the question has been discussed chiefly with regard to some of the points mentioned above, and particularly to prevent the pollution of the rivers and the sources of water-supply. The sewage system drove the large towns to adopt measures for a pure supply of water, and this has been a decided gain on the one hand which we should have been slow to have carried out if our natural river sources

had not become so polluted. But with all our boasted science and engineering feats, the public health of the large towns is not in a satisfactory condition. In spite of all the splendid supplies of fresh water to our modern cities, have our mortality bills been proportionally diminished? Have diseases been rendered lighter, more amenable to treatment or avoided altogether? What has been the absolute amount of good derived beyond having a comparatively pure and palatable drinking water? If water exercises such an influence in our economy one would naturally expect greater advantages from so thorough an improvement as in the water supplied. Are the advantages of pure water in our large cities more than counterbalanced by errors of diet and other disease-producing conditions and habits? Glasgow, with the finest supply of drinking water in the United Kingdom, occupies a worse position than any other city in Great Britain, a much larger mortality than London with its vastly inferior waters, containing, according to a late analysis, over six times the amount of impurity. This mortality reached 37 and 39 per mille for the last and first weeks of November and December respectively, 1884, the average for six weeks being over 35 per mille. This increase is not to be explained, we are told, by the presence of any widespread fatal epidemic. This is nothing new in the mortality of the second city of the Empire. It is said the very young and very old died in unusually large numbers, and that this mortality is not to be attributed to filthy houses, defective drains (these unhappily are not new), but to privation caused in Glasgow at the period under review by depression in the ship-building trade. The death-rate of our large cities is certainly due greatly to the habits of the people. Infant mortality is in consequence also very high; the children of the lower classes being brought up frequently under the worst possible conditions. If this high mortality be not owing to defective drainage, nor to filthy houses, nor to epidemics, and is chiefly confined to old and young, it is not difficult to arrive at a correct conclusion as to the

cause of the mortality. The nature of the fatal maladies in relation to the season of the year would confirm this opinion. If the disposal of sewage has so much to do with the mortality, as is generally believed, cities like Manchester, where the pail system has been in force for ten years, and where the death-rate is still high, fluctuating between 24 and 25 per mille, will not compare with towns in which the water-carriage system is in force. It has been remarked that the old death-rate of this city, 33 per mille, compared with the present 25 per mille, is rather a fallacious argument in favour of the new system, inasmuch as "at that time there were 60,000 cesspools, enough to have made a sufficient quantity of mephitic vapour to have infected a third of the population with all kinds of pythogenic maladies." The water-carriage system, it is stated, works well when applied to towns, and has diminished their mortality from typhus. But what of increase of deaths from typhoid fever, diphtheria, &c.? Villages without the water system and with the old privy system are proverbially healthier than the towns, although this healthiness may be attributable to other causes than the absence of the one or the presence of the other system. Open spaces, birth-rate and other things require to be taken into account. The chief objection to privies is the contamination of the soil, causing disease germs to enter the houses from the sub-soil. But would such an objection, if valid, not be removed by having such conveniences placed further from the dwellings, the application of earth or ashes to the ordure, and above all its daily removal? It is a mistake to have these privies shut up as they are in our large towns; they should be as open and exposed as possible, so as to prevent the generation and concentration of gases, and to guarantee their dilution. Mere fæcal matter *per se* cannot be looked upon as such a dangerous substance; it is our treatment of it that makes it such an enemy to health. Farm labourers and farmers are proverbially healthy, and one will not say that they are less exposed to emanations from pigsties, stabling, byres and fæcal collections, than the city population.

Speaking of soil emanations, the question of soil as causing disease is important. Western science at present teaches us to look for and expect germs of disease everywhere in the water we drink and the soil upon which we live. Typhus fever, if not cholera, are said to be caused by miasm arising from the wet earth. Much is written about the malaria arising from the ground, and the means of counteracting this, and so preventing the diseases supposed to depend upon their presence. But not only do such exhalations appear to spring naturally from the ground, but it seems that the ground is contaminated with poisonous exhalations drawn into our rooms through the subsoil from cesspools, privies, gas-pipes, and the house, kitchen, and wash-house slops which are thrown into the adjoining ground or courtyard, thus furnishing new decaying materials to be sucked up into the rooms by the communication between the ground air and the air of the rooms. In presence, therefore, of the old privy system, it is argued that it is impossible to keep the air of our rooms pure. But what is to be said for the modern system, with our streets intersected by drains and gas-pipes, from which, and especially from the former, there must necessarily be a constant interchange of gases through the porous bricks of which the drains are built, and the pressure of gases in these closed-up drains must tend to drive them back through the pipes into our rooms, and the colder air outside and the warm air inside our rooms tends towards an interchange equally hurtful to the purity of the air of our dwellings. If these things occur under the best trap system and with the best earthenware tiles, even when glazed, how much more so when the traps are out of order?—pipes porous and the joinings imperfect, as is so often the case? And as if to increase the evils, we have sewage pipes as a rule passing under the floors of the house and rendering inspection both difficult and expensive. If the public drains must necessarily be built along the thoroughfares, why should the water-closets, kitchens, and wash-houses, &c., be so situated that the sewage and garbage must find its way to the drain under the house? To what extent does the mortality of a

town or village depend upon the disposal of its sewage? In our generalizations at the present day, do we not often overlook smaller, less prominent, but perhaps not less potent, influences? God's earth, the creation of which was pronounced "all very good," is now shown by scientists to be a great bed of death-producing microbes. Verily in the midst of life we are in death in a sense we have never before so understood. In the midst of it all, however, the great wonder is, not that we are so free of disease as we are, but that we live at all. How our forefathers lived before the days of the knowledge of bacteria and bacilli we do not discuss, and cannot comprehend.

Water and milk (and regarding the latter the opinion is gaining ground that it is almost as much a necessity of civilized life as the former) seem to be the great carriers of infection at the present day. As already remarked, the absence of milk in China and the healthy habit of using boiled water only, rendering the use of permanganate of potash as a test for organic matter unnecessary, removes two important disease-producing factors from life in China. It is not so, however, in Great Britain. Most of the river water unboiled is unsuitable for drink, being unscrupulously and wastefully contaminated by being made the receptacle of sewage; well-water is not unfrequently impure, though its sparkling appearance and freshness to the taste might lead to a contrary supposition; in towns such water cannot be drunk, owing to infiltration from some neighbouring drains or cesspools or other deposit of decaying matter.

At the Health Exhibition were two houses, the one insanitary, full of defects, damp, close, unventilated, untrapped drains, overflow pipes from cistern in communication with sewers, no ventilation for the products of gas combustion—arsenical wall-papers, and every ingenious appliance for letting as much bad air *in*, and keeping as much good air *out* as possible. Adjoining it was a sanitary house with all the above defects remedied. It was observable that the insanitary house had purposely arsenical wall-paper without a trace of green colour, and

the sanitary house had green paper without a trace of arsenic. The establishment of a sanitary institute for the inspection of houses and the granting of certificates to builders and plumbers for good sanitary work accomplished should remedy matters. It is impossible to conceive what inducement exists for putting up supposed insanitary houses, when at the same expense they could be made sanitary. Sanitary engineers, architects, builders and plumbers, who ought to know their business, have been hitherto to blame for the insidious introduction of drain air to unsuspecting tenants. Knowing such defects, why should houses be erected ?

Further reference to the disposal of sewage in China is unnecessary. The chief processes in vogue in England are known as the Manchester system, where the refuse matters derived from human beings, animals, vegetable matters, dust, &c., are carted away to be destroyed or manufactured into useful products. Moule's earth system, where there is no manufacture but restoration direct to the soil, whence it has been derived, and which is analogous to the Chinese procedure, and whence apparently it has been borrowed, and the A B C process, which consists in concentrating the sewage into one point, mixing it in a reservoir with blood, charcoal and clay, and afterwards precipitating it with sulphate of alumina ; the supernatant clear fluid flows off into a river without polluting it, and the precipitate is dried and worked up into saleable manure. In Manchester all refuse matters are kept as far as practicable out of the sewers. There are no water-closets, and the excreta are received into a pail and mixed with fine ashes. The animal matters are deprived of their fat and worked up with soap, grease, &c., and treated with SO_3 to fix the ammonia ; the dried mass broken up and pulverised is sold as manure. The excreta are similarly treated. The cinders are used in the furnace fires. The rags, paper, iron, &c., are sifted out and sold. Some of the refuse is made into bricks, mortar, and concrete. We have noted briefly these three systems here to compare them with the

economical, effective, and simple plan adopted in China. It is a question whether much of the value of the excreta is not lost or destroyed by fire. Much of the organic matter, such as cabbage, potatoes, domestic dust, &c., exists in a condition already highly suitable for the farmer's dunghill or fields, the rags, paper, iron, wire and tin, are rightly sifted out and sold—a quantity of other rubbish, such as glass and stone bottles, broken pots, flags, mortar and brickbats, is suitable enough for the fire, to be reduced to concrete, &c. The enormous quantity of wet and dry cinders, which exceeds more than three times the amount of domestic dust, and about a fifth more than the amount of human excreta, which is consumed in the furnaces, would in China be burnt by the poor people themselves. There is evidently here a great waste of fuel, and the same holds good all over the country. Contractors, instead of paying for all this refuse, require to be paid for its removal, thus greatly increasing taxation. The scavengers in China pay small sums, either in money or useful household articles, for such refuse as they can turn to account, and there is little they cannot make useful. Old boots, shoes, hats, vegetable refuse, human excreta, straw, matting, brushes, cinders or unburnt coal, brickbats, rags, paper, iron, &c., have all a money value. In the suburbs of our towns the poor people and small vegetable gardeners and farmers could most profitably rear more pigs to consume the enormous quantities of kitchen vegetable refuse which is available. Cooks or other domestic servants might be feed in a small sum to guarantee the preservation of kitchen refuse, which should be daily removed. Many of the Irish in our large towns follow this lucrative occupation in the rearing of the animal that "pays the rint." In Scotland they are termed brock-women, from the German "brock," a crumb.

Sanitation and Disposal of Sewage.

In the *Century* for November, 1884, there is a paper in which the author, a practical sanitary engineer, lays down some general principles of house sanitation. The house

and ground under and about it and the air in and around should be dry and clean. Perfectly arranged and constructed, sanitary houses are extremely rare. Those which, having begun perfect, continue so under daily occupation are still more rare. In view of this it is often asked if it is worth while to encounter expense and the constant attention perfection demands, and whether the world did not get on well without these sanitary improvements and in spite of grave sanitary defects. Of course it is asserted that the world has not got on well nor is getting on well, and infant mortality, suffering, loss of time, incidental expense of unnecessary suffering, shortened lives, expense of attending the sick and interring the dead, &c., are adduced in support of the contention.

The objects aimed at in the drainage of a house and site are the removal of excessive dampness and the providing of means for the water transport of organic wastes to a safe point of disposal, in such a way as to prevent decomposition on the premises, and to exclude from the house all air which has been in contact with these matters after their discharge into the drainage system. Dampness of the foundations and cellars, however caused, is to be avoided, or if present to be rectified. The exhalations from the ground of the atmospheric impurities of the subsoil have also to be guarded against. If the drainage of the house is discharged into a sewage, the return of the air of the sewer to the subsoil under the house must be prevented. The dampness of the foundations must not ascend the walls nor must the aërial exhalations of the soil enter the house. Changing barometric pressure, the rise and fall of water in the soil, and the action of winds producing a strong draught in chimneys, causes the soil air to enter the cellar and the house. This evil exists in a clayey soil, and still more in one more porous. An exaggerated illustration of what exists universally over wide ranges of country, as indicating the atmospheric interchange which is constantly going on, is given as a mass of broken stone with its putrefying carrion below and its human habitation above. When the chimneys

are drawing strongly, this interchange is very active. He pictures a village with a water supply and "all the modern improvements," all except sewers. The disposal of its household waste of all kinds is *into*, not *upon* the soil, and thus the whole subsoil gets contaminated. The air under the house cannot be ideally perfect, however free the interchange between the air in the ground and the air over it. During frost, when the interchange is cut off and when cellars and wells form almost the only means of communication, then the condition is infinitely worse. And notwithstanding this the dwellers on light soils have relatively a low death-rate contrasted with communities on damp clayey soils where the atmospheric interchange is much less active. The death-rate in the former is said to be low, not because of, but in spite of, the almost universal breathing of products of putrefaction as exhaled by the soil into the houses. Could this element be withdrawn, the sick and death rate would contrast still more strongly on the lighter soil.

If proper sewers were provided an absolute suppression of all vaults and cesspools would suffice to secure the early purification of the ground, for the bacteria of putrefaction —those universal scavengers—would soon make away with the existing accumulation. How far their action would modify the ill effects of the constantly renewed underground filth, there are as yet no means of knowing. Sewers are to be the great purifiers of the soil. Any one who is living subject to the influences of an evil due to his neighbour's many cesspools more than to his own single one, ought to protect himself by isolating his house as effectively as possible from the ground. Concrete floors and granite walls are as a sponge to the penetration under slight pressure of atmospheric currents. Compact clay with an affinity for moisture is a good barrier to the passage of impure air when used in the damp atmosphere of a cellar or about a foundation. For the sake of cleanliness it can be covered in the cellar with concrete. Asphalt is equally serviceable over the outside of the foundations and between two thicknesses of concrete.

It is believed that some of the minor and some also of the more serious ailments affecting the race are due, not to the existence of an excess of filth, but to the influence of an excess of moisture acting upon a little filth or on a little organic waste. The soil has an influence over the interior climate of the house which is even stronger than external atmospheric conditions.

Improvement has been made in house drainage. Mistakes have been made. The practice of the art has not kept pace with its principles. Better workmanship is now done. Leaky joints, though still by no means uncommon, are less frequently found. Soil pipes are ventilated. Drains under cellars are now much better constructed, and municipal boards of health have interested themselves in the subject of plumbing regulations. At present plumbing regulations that are permitted will hereafter be prohibited, and some things are now required which hereafter, perhaps, will not be permitted.

The amount of plumbing work must be reduced to the lowest convenient limit, the greatest simplicity secured, and every part fully exposed to sight; channels passing from one story to another must be blocked absolutely tight. Proper flushing and ventilation will prevent the evils of sewer gas, and all deposit will be avoided. Sanitary science aims at securing the exclusion of drain air from the house, all filth to be carried away at once, and the trap to be immediately filled with water. So much for the first paper.

The evils in the way of nuisance and disease resulting from ill-advised and imperfectly devised sewerage schemes, led a Royal Commission on the sewage of the Metropolis to say that even the cesspool system deserved consideration. We are told that all the objections to the principle of water-carriage could be met by our attention to well-known rules. The London sewerage, we are told, is filling up the river, altering the channel, and checking navigation. The pollution in summer is so great that the river looks like a great black stream of sewage and sewage only. Some process of deposition or precipitation is recommended,

the sludge should be applied to raising low-lying land, or burnt or dug into land, or carried away to sea. It is necessary to have a reasonable and permanent, rapid and easy method of dealing with it. The ammonia in the sewage is valuable. It is said that sewage as applied to land and crops had no chance of realizing a profit. But is this quite certain? Better to raise our low land and enrich our poor and sandy land than pollute our rivers, injure our health, and throw such treasures into the sea. Practically we have not yet reached the point of estimating the extreme value of such manure. If sewage cannot be made by reason of the quantity of rain water and household slops contained in it, then let us devise some method by which it will pay (for it ought to pay), and in the event of discovering no better let us adopt the Chinese plan. But even supposing it did not pay, would the nation be squandering its money in bringing under cultivation vast tracts in the neighbourhood of our large towns and all over the country accessible by railways, and nationalising these portions at least of the soil, and planting a peasant proprietary upon them for the supply of dairy and vegetable produce for our markets? With Chinese industry, patience, and thrift, the wilderness may be made to blossom as the rose.

Without chimneys, carrying so much draught and interchange of ground exhalations with the upper air, and without cesspools and sewers, what a paradise Chinese houses must be! The soil is not defiled with artificially created evils and then sanitary engineering appliances invented. But even supposing kitchen putrefying grease, fæcal matter and laundry slops to be thrown *into* the soil, does it necessarily follow that the whole atmosphere of the gravelly earth (the condition supposed) is one of marked contamination? Is there no purifying influence in such a soil? In Chinese houses there are, moreover, no cellars. In view of the ventilation of the sewers and house drains of our large cities into the open sky, are the purifying properties of the air illimitable? and is it impossible at any point, in any manner, and at any time, for such air to gain

admission into the house? The Chinese in our colony of Hongkong have a dread of the introduction of the water-closet system into their houses, and memorialised a former governor against the introduction of Western sanitary systems upon their own immemorial bucket system, which worked well and to which they were well accustomed.

We have heard a good deal lately of the establishment of sanitary institutes. One good effect of subscribing to them is that one can have his house inspected and the state of his drains looked after. When any unexpected and unaccountable disease breaks out in a family or bad smells are felt, the drains are at once suspected, and on examination how often are they found in a most unsatisfactory condition—the pipes not even meeting by considerable intervals. Such drains have often been found laid disgracefully, no cement, only a little mortar like mud on the top of the joints, and on account of being laid in soft yielding ground, which has sunk considerably, the under parts of the joints have been found opened and affording an outlet to the water test, applied to prove their satisfactoriness. The soil, of course, in the neighbourhood of these flaws is thoroughly saturated with night soil and developing large quantities of germs.

In the *Century* for Dec. there is a second paper, not intended as an indictment against all sanitary appliances, and not to give full directions for the guidance of house drainage work, but rather to set forth certain points for the information of house builders. He makes some very serious admissions in regard to the dangers arising from even the best sanitary appliances, and the difference of views entertained and still held by sanitary engineers regarding the first principles of the subject, that we may well be staggered at the risks we are daily running, and resolve to follow the Chinese plan, and build our houses without drains and waterclosets and other nineteenth-century scientific appliances for creating and spreading disease, although ostensibly for the prevention of the same and the security of greater comfort. The above writer says that the question of a main trap between the house and

public sewer has been much discussed, but not yet determined. The question is made to turn on the degree of foulness of the sewer. Without the trap it is said the "sewer gas is laid on" to the house, and there is the danger of intercommunication with the infection of other houses. The trap will, it is true, shut off the air of the sewer, but it may also not only form a seat of decomposing filth, but set up a back flow so as to cause a foul deposit along the house side of the drain. Unless the sewer be extremely offensive there will be less stench coming from a current of air flowing from a sewer without a trap, than will be developed in a house drain itself with a trap. This argument is founded on ventilation of the drain, but how many drains, we would ask, still (in the older system all) have either none or very inefficient ventilation? The stability of traps is a question of importance now; in older work, pressure of the sewer atmosphere caused the foul air to escape into house drains by forcing traps or working its way out at defective joints. And how often these joints have been found to be defective is well known. Now traps are said to be reliable, drains are tight, ventilation is free and complete, pressure on sewer air is not to be feared, and *in the best work* (the italics are ours), the joints are absolutely tight. The condition of the drain will always be improved by the ventilation furnished by the untrapped drain. But again we ask, suppose the drain to become specially foul afterwards, how is it to be discovered and trapped? The free ventilation through the roof is next treated, but does this exist, we ask, in all houses, or even in the majority? Why are the gases from this free ventilation not supposed to have any injurious effects; is it because not admitted into the houses, but diluted with the atmosphere, precipitated by rain, blown away with the wind? If so, is this not identically the condition furnished by the Chinese system? and the same conditions can be attained by the open privy system if carefully carried out. In cases of fog and calm when this drain air is returned upon us in our crowded cities, is there no danger of infec-

tion—of diseases being carried through the air which have hitherto been supposed to be engendered exclusively by soiled water or milk? An examination of the air under those circumstances might throw light upon the origin of disease, and probably also the contamination of milk and water. The bravest may tremble as he reads further of the dangers to which he is exposed. To obtain this ventilation wherever a trap is used there must be an inlet for fresh air on the house side of the trap. This will insure adequate ventilation, not only of the main drain but by the law of diffusion of gases of the short branches. We are told, however, that many of these fresh air inlets in cities get obstructed by rubbish or entirely closed by accumulations of snow. When so obstructed, their efficiency stops, and the security they afford is withdrawn. These inlets are found sometimes at the edge of the pavement or face of the curb, but no annoyance has ever been felt at the inlet pipe being brought out at the face of the foundation wall, *preferably, of course, not too near to windows and doors!* No annoyance results from the slight outward puff from them when closets or baths are discharged, because the offensiveness of the drains has been reduced by the constant though slow movement of air through these well-flushed pipes! Do the slight upward puffs in bath-rooms, washstands, urinals of one's own house, or when similar apparatus are discharged in flats above amount almost to nothing? Does the whole mass flow with such force as to carry everything with it? Do the same puffs conveyed to the cisterns whence your drinking water is drawn also amount to nothing? These questions are asked by us in ignorance of the subject.

The greater certainty of tightness and correct grading is said to be a strong argument in favour of iron pipes as against earthenware pipes, at least in the house and over ground that has been disturbed by excavations for foundations.

The plans proposed under hydraulic pressure for testing the workmanship, appear satisfactory, at least in theory as

given by this writer, but are they carried out in practice? Rusting of the pipes, development of leaks, are not likely to occur for many years. Regarding the difference of thickness of pipes between one side and another, we are told that a very slight difference is a very serious matter in common pipes, and even in thicker pipes air bubbles in the mass weakens the pipe. The sudden discharge of a water-closet conveying a large quantity of water, produces a suction action upon the branches which admits air from the top soil pipe.

The ventilation of the soil pipe is said to be a matter that has been much bedevilled by invention. The cap is not needed in positive winds, and is an invariable obstructor of the movement of air during calms or under light winds. The cap, which is almost always used, is of no utility in high wind, and an absolute obstructor at other times. The efforts of sanitary engineers, he tells us candidly, have been only measurably successful in inventing and patenting a sewer-gas trap. The successful accomplishment of the object in view offers probably the most hopeful field to which sanitary inventors can turn their attention. The back ventilation causing evaporation destroys the water seal, by removing the water in a short time. Traps are also frequently emptied of their water by capillary attraction through means of rags, bits of string, matting of hair, or any other porous substance, having one end immersed in the trap, and the other extended over the bend and leading into the discharge pipe. This capillary action is frequently the source of the failure of a trap. Bower's or Cudell's mechanical traps seem to be the best available, but they have never been entirely satisfactory. The simple S trap as ordinarily constructed, and as ordinarily ventilated, he says is totally unreliable.

Ten years ago, we are informed, the plumbing art was an extremely crude one, and in which perfection has as yet by no means been attained. A long series of plumbing appliances have been adopted and discarded one after another. Special plumbing appliances in the art of drain-

age are to be numbered by hundreds. Invention has taken advantage of a growing demand for the attainment of additional security against the invasion of drain air, and has literally run wild. There is an embarrassing variety of all manner of devices. Few of them are made with regard to the most imperative need of the work—simplicity.

He notices the hidden untidy condition which is almost universal with the tight unventilated enclosed spaces generally used for washstands in bath-rooms and lavatories. The basin itself, as now constructed, has a hidden overflow which it is very difficult, if not impossible, to cleanse, and is generally very nasty. To shake a filthy chain in a basin of clear water, would be a very untidy preliminary to ablution, and yet this is what we substantially do when water flows with some force into a basin, in which the dirty chain is hanging. The side plug *seems* (the italics are not mine) to be much nicer, it is really less nice. There is the befouled waste-pipe leading from the outlet to the plug, which it is practically impossible to cleanse. Its filth is constantly undergoing decomposition. A movable wash-bowl emptied by pouring its contents into a funnel fixed basin without plug or overflow, appears to be the best sanitary basin.

The universal pan-closet, which is still the great favourite of landlords and of builders, is, we are told, absolutely inadmissible, and those who care for safety in drainage works will neither adopt it in new construction, nor retain where it already exists. It is not and cannot be made a safe water-closet. To a greater or less degree the objections to it hold in the case of every other closet in the market which has anywhere in the course of its outlet anything of the nature of a valve or moving part. It is not an overstatement of the universal conviction of skilful sanitarians to say that the range of unexceptionable water-closets is limited to such as have a free water way from the bowl to the soil pipe, depending for their trapping, and in some cases for their holding of a bowlful of water, in an elevation of the overflow point. The costly housing in of the closet

by a close seat often covers a condition of things that no fastidious housekeeper would knowingly tolerate. Stoppage, leakage, and the tainted air rising through the irregular holes left for the soil pipe, unite to make this space untidy and in every way objectionable.

In regard to sinks, he observes, that after a little retention, putrefaction sets in and the refuse food of the sink becomes as offensive and objectionable as does the digested food of the water-closet. The liability to detention and deposit in the sink is much greater than in the water-closet, because through its waste pipe with less flushing, there is discharged a considerable amount of liquefied grease, which cools along the course of the sink, and attaches itself to the sides of the pipe in constantly increasing accumulations, until the channel is nearly or quite obstructed. With the grease there are involved highly putrescible matters, and the ordinary kitchen waste pipe is the seat of constant decomposition, mostly beyond the trap, and for this reason not specially noticeable. Not to get rid of the putrefaction, but to prevent the obstruction of the pipe by hardening the grease, grease traps have been devised, but so long as water will flow from the sink, servants will give themselves but little trouble about such accumulations. A strainer at the top would stop all coarser substances, and these could from time to time either be burnt in the range, or disposed of daily along with more solid and bulkier garbage to pig feeders. The cremation, the writer wisely adds, of the worst problems of house garbage, costs no money and little trouble, and solves one of the difficult domestic problems.

Overflows from bath-tubs, wash-bowls, &c., are practically never reached by a strong flushing stream, and their walls accumulate filth and slime to a degree that would hardly be believed. They constitute the nastiest element of modern house drainage of the better order. Perhaps they are not a serious source of *danger*, but they are more often than any other part of the plumbing work, except the urinal, the source of the offensive drain smells so often observed on first coming into a house from the fresh air.

The stationary basin overflow is objectionable for substantially the same reason that the bath-tub overflow is objectionable. The reason why the usual hidden overflow is objectionable he illustrates by a diagram. Where the waste pipe is closed at the bottom of the overflow by a plug or valve attached to a spindle rising through the overflow pipe—a very favourite device with some plumbers—the difficulty is in every way aggravated and the amount of fouled surface is much increased. The inherent defect (illustrated) attaches to every overflow of this general character connected with any part of the plumbing work.

Of stop-cocks, he says, sanitary objections to the bottom delivery of the supply are fewer than would be supposed, and it seems strange that the frequent serious objection to the arrangement should have been so generally overlooked. With the use of such cocks for filling wash-bowls, an indraft of air when the cock is open must frequently have been noticed. He adds, the indraft of air is not of much consequence, but the indraft of a pipeful of dirty water from a bath-tub does not suggest a pleasant modification of the quality of the water supply of the house.

The remarks of this candid and able writer we leave to speak for themselves. The importance of the subject, however, is our only excuse for dwelling somewhat further on this all-absorbing topic of sanitation.

In view of the incessant efforts that are being made to get rid of sewage and of the evils resulting from sewage gas—the present household bogey in England—one is tempted to inquire how our forefathers lived, reached adult age, and handed down a healthy posterity. Then people lived in a delightful state of carelessness regarding drains and drainage (if indeed such existed in our sense of the word), and enjoyed as a rule as great an immunity from disease, or greater than is now obtained. We have often been struck with the healthy state of the robust, sturdy men who go into the main sewers to remove refuse and also whose fate it is to work at the great pumping stations, men

who fear no sewage gas save that which is combustible and liable to explode if brought into contact with a light. At Peking the excrement collectors and driers, the excavators of the drains, the police who draw the refuse water from the dirtiest and most unfragrant of drains with which to water the streets, the poor people who live on these drain-watered streets surrounded by the most insanitary conditions, live and flourish. The Schneiderian membrane of these people is the same as our own, and distinguishes between good and bad smells. If our insanitary environment goes on increasing in the future as it has done in the past, without some remedy being applied, it is difficult to see how we are to continue to support the burden of civilized existence. It seems to be one of the unavoidable penalties of civilization, that we should live under unwholesome conditions of life. We have works prejudicial to health, killing both animal and vegetable life, polluting our rivers and killing our fish ; the earth returning to us undestroyed germs ; fire taking our oxygen and giving us back unconsumed carbon, in the shape of smoke and smut ; water developing affinity for noxious matter has become the most insidious of all, rendering boiling it the only safe procedure, and the air, the only remaining one of the old quaternary of elements, receives pollution from our sewers, drains and chimneys to return them to us again. The insanitary environments of Peking and Chinese cities generally are dirtier than any Turkish or Egyptian city, or than London 200 years ago, and still there is no yearly plague nor any devastating visitation. From the cesspools, if we may so call them, or stagnant water rather, on the streets and under the very houses, bubbles of gas are continually being sent forth. These are, however, as a rule exposed to the purifying agencies of wind, sun and rain, and are not choked up and concealed as in the drains of Western cities, where they act as reservoirs for large quantities of decaying matter, breeding poisonous vapour. From these choked-up sewers, dangerous gases bearing disease and death arise, and rushing back enter the dwellings in a con-

centrated form. It is believed and asserted that our rivers are the natural drain for the district through which they pass, and except in very dry seasons this disagreeable fact is not likely to attract attention. London is counselled to follow the example of Rome in the supply of water as well as in the disposal of sewage, where water is brought from a distance and where sewage is allowed without let or hindrance to take its natural course into the Tiber through the *cloaca maxima* and other similar channels. Were these drains in ancient Rome used for anything else than mere surface drainage?

House Accommodation and Overcrowding.

In our Western cities, compared generally with those of China, there seems to be more overcrowding. In some districts of London, we are informed that there are as many as 200 tenements to an acre, with a population of perhaps one thousand, which gives more than half a million to the square mile, and as London has 120 square miles, it would hold, were it built over at this rate, from fifty to sixty millions of inhabitants. Such a mode of building as this indicates must be wrong in principle. Moderately high blocks of buildings seem only applicable to the wants of a great city. Unless London is to spread over several counties, it would appear as if it were absolutely necessary to build more in flats, and to give up the idea of each family occupying a self-contained house. Can comparatively lofty and suitably arranged dwellings in flats not be constructed consistent with a higher measure of health than at present rules? At present people of different habits are crowded together, the thrifty, tidy, and honest with the profligate, dirty, and dishonest; houses soon fall into an insanitary condition; repairs are not executed; slovenly, dirty, and intemperate habits are contracted; the houses and rooms are close, narrow, and badly arranged, badly lighted, heated, and ventilated, without good water supply, and other conveniences; there is overcrowding and subletting, the remuner-

ation of many trades being insufficient to provide houses in better localities; rents are high, owners being determined to realise profits in spite of the misery of the people; common staircases are not regularly cleaned and white-washed, &c. Such is the doleful picture which has been drawn of many London dwellings. All this would read to the Chinese as a fairy tale.

Some progress has been made in providing a remedy for these evils of house accommodation. Suitable tenements have been erected with every sanitary requisite, but very much still requires to be done. Government can do much in the way of regulating the number of inhabitants in each building, preventing overcrowding, disallowing subletting, and in the inspection and registration of all lodging houses, and perhaps more might be attempted. The healthiest condition would be where these things are properly attended to by the people themselves. And if things were in a normal healthy condition it would be so. There is, alas! not only work for a patriarchal government, but plenty also for reformers, philanthropists, and sanitarians. Wretched dwellings are only one incident; poverty, ignorance, and crime, are other factors. All are interdependent. Migration from the country into the cities is a constant phenomenon. It aggravates all the evils of town life, reduces wages, increases the pressure of accommodation, and accounts in part for the acuteness of the distress which prevails. In another paragraph we have indicated briefly how this immigration from the country could be prevented with profit to both the agricultural and urban population. The people that now inhabit the slums of our large cities become so demoralized by their surroundings that they are not fit to be moved into new houses, and such a change as this can only be carried out gradually. Without training the poor degraded people in habits of thrift, cleanliness, sobriety, &c., no improvement in their houses will be of much avail. We may sweep and garnish them as much as we like, but the evil spirits will return, and the condition will be manifold aggravated. This is physically as well as morally true.

External circumstances are not alone responsible for all ills in men's lot, and mere change of environment will not make them wiser and happier. The people must be helped to become better in themselves. The moral benefits in such an amelioration of the house are almost equal to the physical benefits. The people curse their poverty, and make it more remediless by intemperance. An ocean of sin, social and moral degradation, is fairly and honestly attributable to this demon of intemperance. I sometimes think that total abstinence from all intoxicants, seeing that they can be used by so few in moderation, would be the most effective cure for nine-tenths of all the evils and diseases which afflict society. Overcrowding is said to arise from low wages and high rents, but if thrift and temperance were cultivated, it is certain that even comparatively low wages could be made to go much further than they do. The opulence and luxury of one class seems to be built upon the moral and social ruin of the other.

Our great centres of industry have been inundated by Irish immigration. This people, whose habits, mode of life, and vocabulary, render them undesirable neighbours, seriously complicate our overcrowding and excess of labour. All evidence tends to show that the Irish are the least improvable of our town population. In fact, previous to the potato famine, our large towns in Great Britain hardly knew what insanitary environment meant. The same class that has lowered the sanitary condition of our cities has filled our poorhouses and gaols. The dwellings of our Irish fellow-countrymen are unspeakably bad. The difficulty is increased by bitter religious animosities, and their obstruction to social reform. Their case seems well-nigh hopeless. Not only has this hopelessness in regard to them been expressed, but some of our leading medical journals think it is fruitless to hope and strive after sanitary improvement. They can admire, but cannot imitate. Science and art after all, they say, is dependent upon invalids. We are like an exhausted crew toiling at the pumps while the ship is leaking two gallons for every one they can raise. The

entire abolition of the zymotic diseases, they tell us, would not lower the death-rate by more than three per mille. We are assured, however, that the ills springing from immorality and intemperance could be curtailed by science and good sense working in alliance with the state and other agencies; blindness can be diminished by one-third, bronchitis and the many diseases that spring from chills, it is said, will doubtless still continue in spite of cold baths to lessen the liability to bronchitic attacks, and the same may be said of gout and rheumatic fever. Nervous diseases are said, in the last twenty-five years, to have been nearly doubled, and the same is true of suicides; the very conditions of civilization adding on a larger number of deaths at one end, than science by its best efforts can cut off at the other. One great object of these pages is to show that the case is not so hopeless as is believed in the West, and our chief aim has been to point out in what directions reform and improvement may reasonably be expected.

Among many wise arrangements relating to the houses of the working people, there is one which closely resembles a practice in operation in China—I refer to the monthly payment of rents in advance. This rule is said to work well, and to be invaluable to the poor man's welfare. In this way people get better accommodation, because rents are sure, and landlords get better tenants. In China among the very poorest there is a daily payment. Somewhat higher in the social scale, monthly payments are made when pensions or wages fall due, always in advance, and in addition one or two months' rent called "tea" money. This plan secures better tenants, and a kind of guarantee for more or less permanent residence and good neighbours. A month's notice of removal is given on both sides, and then the tenant sits rent free the last month. This gives the landlord a full month in which to look out for and secure another tenant. In the case of two months' tea money having been advanced, the tenant loses one month. Another good principle in China, and worthy of adoption, is the necessity of finding security, *par excellence*, a shop

surety. A tenant who cannot procure this is not worth having.

It is to be feared that the rules laid down by sanitary associations, and the machinery employed to carry out sanitary work, are too complex, and that among our common people, who in many cases are very ignorant, the sanitary terms employed are not understood. At the Health Exhibition I overheard a visitor remark that the insanitary house there exhibited was very like her own, and she liked it uncommonly well, and was unwilling to make any change.

Funeral Ceremonies and Disposal of the Dead.

Regarding the funeral ceremonies of the Chinese, it is enough for our present purpose to note the evils connected with the custom of retaining the dead body in the house, courtyard, or in temples outside the city (as in the case of those belonging to other provinces or distant places, and requiring, as the Chinese custom does, interment in the family burying-ground), irrespective of the infectious nature of the disease from which the individual may have died. The danger is vastly increased when it is remembered that during the period that the body remains in the house a large and lofty mat awning is erected over the court, in the middle of which the coffin is placed, and large numbers of Buddhist and Lama priests, sometimes nuns and Tauist priests attend, who chant their prayers and read their sacred books, masses as it were for the repose of the soul of the dead. These sometimes extend to three days and nights. Again, the funeral *cortège*, especially among the rich, is large, as many as sixty-four bearers being employed to carry the huge catafalque. Besides these are the musicians, friends, relatives, neighbours, and the entire *rag-tag and bobtail* of such funeral processions, carrying all sorts of tablets, flags, or pennants, &c., and frequently extending to two miles in length. The chief male mourners, dressed in white, walk on foot immediately in front of the catafalque ; the female mourners in carts behind—mules, harness, and

cart being all covered with white sackcloth. The latter frequently require to keep at some distance from the bier to avoid the disagreeable smell. As there is no isolation or separation of the sick, so there is none of the dead. The members of the family and neighbours are thus placed in considerable danger. When an epidemic occurs, it must be very difficult to stamp it out. The etiquette of the country has to be observed independent of all consequences. The higher in the scale the longer is the period in which the body is retained. The period of time that must elapse previous to interment, and the lucky day on which it must take place, are decided by a class of geomancers, or rather necromancers, recognised by the Government, called *yin yang* officers, who issue certificates (called *yang pang*) of death, without which no dead body is allowed to pass the city gates. No interments are permittted within the walls of Chinese cities; the apparent exception to this in the Chinese city at Peking arises from the fact that the Chinese or Southern city is recognised as merely the suburbs of the Tartar or Northern city, which alone is called Peking. The Chinese have no cemeteries in our sense. There is near all large towns a common or official burying-ground for the poor. The better classes in large cities purchase land in the neighbourhood for family burying-grounds, and all others are interred at their own homes. Should they die away from home, they are carried thither and buried in their own fields, and when circumstances do not permit of the corpse being taken home, the coffins are deposited *pro tempore* in temples outside the cities until a favourable moment arrives for their removal. The coffins of the wealthy are made of substantial wood and are very costly. They are carefully caulked, painted, and varnished, and are thus preserved for many years. Those of the poorer people often emit the foulest odours, and are covered in summer with swarms of flies. The period in which the body is retained before interment is any multiple of seven. The uneven numbers are always preferred. No corpse, not even that of the Emperor, is allowed to remain

in the city beyond 7×7. There is great respect shewn for the dead. It is taken as propitiating the supernal and infernal powers; and so, with the view of averting and warding off calamity from the family, dutiful and filial sons pay great respect to, and spend large sums upon, the funeral ceremonies of their parents. The Chinese, of course, are not insensible to the opinion that may be formed of them by their neighbours in regard to their reverence for the dead. The condition of the dead as well as the living is influenced by the actions of the living in their duties to the dead. The yearly visits to the tombs and the burning of imitation gold and silver ingots, to supply the wants of the dead in the other world, are universally observed.

The Chinese inter their dead most frequently in the ground, although sometimes the coffins are deposited on the surface, bricked over, or covered with a layer of mud. Children under ten years of age, not being supposed to possess souls, are not entitled to interment in the usual way. They are conveyed in mats or cheap coffins to the nearest *morgue*, whence they are carried in a bullock-cart to some common pit and interred.* Decapitated criminals have their heads stuck in cages on the streets, and their bodies thrown into the *wan jen keng* (pit of myriad men) at Peking. Buddhist priests are sometimes cremated. The fleshly image of the first emperor of the present dynasty is said to be the bronzed-looking object which is to be seen in one of the temples near Peking. It is related that, after reigning eighteen years, he abdicated and became a devout priest at this temple. Cremation, according to the ancient custom, is considered the proper mode of disposing of the bodies of deceased priests. When not burned, Buddhist priests are dressed in a sitting posture with legs crossed, in a wooden case like a Sedan chair, then buried, and a small pagoda erected over them. The Mongols throw out their dead on the plain, to be devoured

* See articles on "Infanticide" and "Foundling Hospitals in China," in Peking Hospital Reports, 1865.

by wolves and other wild beasts. Children in China are often also so disposed of, it being considered lucky rather to have the child so carried away to the mountains by a wolf as carrying the disease and calamity with it, and so saving other children born to the parents. Animals, too, are burnt in sacrifice at various temples, so that the idea of cremation is not foreign to the Chinese mind. Could relatives *see* the loathsomeness of decay and decomposition of the dead body, and feel the smells that we sometimes feel at Peking when a funeral passes along the street, sentiment would soon give way to a more sanitary mode of interment. All nations seem to cling to the idea of the very body either being raised again, as with Christians, or appearing in positions in the other world analogous to the ones occupied in this. Even the Jews clung to the idea of the *os sacrum* being immortal, and the seed or root of the future body, and hence the name given to this bone.

Public Baths.

Public baths are found in all Chinese cities. Many of the people take a bath once a week. They invariably have recourse to the bath when they feel out of sorts. They rub down frequently with their coarse loosely woven cotton cloths. When working they usually have one such towel hanging over their bare shoulders, which is used as often as necessary in wiping off the perspiration. In their morning ablutions, in the absence of flannels and shirts, they are, of course, naturally stripped to the waist. Hot water baths exist for the poorer people, where the water is changed not more frequently than once daily. The poor people strive to go early to get comparatively clean water. The keepers of such baths are particular, however, not to allow any persons with skin diseases to enter. The price, cheap though it be, precludes the beggars and the very lowest. Even such soiled water must always have a cleansing effect upon objects dirtier than the water itself. Private baths are always to be had. Baths where the

morning ablution is obtained with the shaving and plaiting of the queue are well patronised. Public baths are recognised by a lantern, lighted at night, suspended from a high pole. It is evident from the Chinese practice, if from nothing else, that daily baths, whether of cold or hot water, are not essential to health nor even comfort. In a warm climate cold baths are to be deprecated from the danger of setting up congestion of the liver. In the barber's shops, which are extensively found in Chinese cities and patronised at night, the various forms of massage are practised. Similar practices also obtain in the homes of the well-to-do who have boys or young female slaves, who perform for them these soothing operations before retirement for the night. The author has an illustrated work in preparation on another form of massage, viz., *kung fu*, or the science of movement in the prevention and cure of disease, from a Chinese point of view.

Workshops.

As to workshops and occupations, there are no great factories with large collections of workmen. Labour is much divided. All handiwork is either carried on out of doors, in the free expanse of air and exposure to the sun and wind, or the workshops, like the ordinary shops, are all open in front. There are no injurious trades or noxious manufactures polluting air, earth, and water. It is with the development of commerce and the growth of luxury that influences, injurious to health, spring into active existence. Civilization has made such strides in the West that she has succeeded in overturning the equilibrium of nature. The equilibrium must be restored as in China. The Chinese shoemakers cut their leather and dress their shoes on boards on the counter or on their knee, not against their chests, and sew their uppers in a similar frame to that used in the West ; the tailors stand at their trade, instead of sitting, as with us, and sew beside long tables. Even painting and gilding by means of mercury do not seem to

produce any bad effects among the workmen. This is perhaps to be explained by the work being carried on so much in the open air. A certain varnish, I have found, produces an eczematous eruption of the skin, or desquamation of the cuticle. Apprenticeship in China is long in all trades; the workmen, as a rule, live with the master.

The hours of labour are long, but interspersed with frequent periods of rest, such as drinking of tea, smoking tobacco. These periods of rest, extent and number, are regulated by the season of the year. The wages are very low, amounting for unskilled labour with food to a few pence daily. Skilled labour of all sorts rarely exceeds a shilling per diem. Trade accidents are very rare. No machinery of any kind is employed; all work is done with the hand. The people are so ingenious that the simplest tools prove sufficient for the finest and most complex work.

Schools.

The Chinese have long been considered a reading people; office is only attainable through learning; China is the cradle of the competitive system, and yet, excepting some charity or free and mission schools, the great majority of the literate are educated at home, through tutors who live in the family. There are no schools, primary, secondary, parochial, technical, or normal; and no universities and colleges as we understand these terms. Science, languages, mathematics are nowhere taught. The whole system seems to consist in committing to memory the classics, books on political economy, morality, poetry, and history handed down from early times. The memory and the mechanical ingenuity and general neatness of the people are exercised in remembering and writing their peculiar hieroglyphs. Compared with Europe and America, they are far behind in the matter of education, even as concerns the three R's. Hardly 20 per cent. of the people can be said to be highly educated. The large majority know just enough to keep accounts, conduct their ordinary business, and read some easy books,

more or less in their own dialects. So very few women are taught to read that the entire female population may safely be left out of the calculation. Those that do learn to read would seem to be superior to the men, as witness the present Empress Regent. The boys who learn to read have their memories early and chiefly, one might say exclusively, developed, the nature of the language perhaps demanding this unfruitful and laborious task. The imagination does not seem to be developed in early life as with us. The school hours are long, from six or seven o'clock A.M. to five or six o'clock P.M. The noise in the school is of the loudest while the scholars are committing their characters to memory. The forenoon of each day, when the mind is fresh, is spent with the new lessons ; the afternoon, when the mind and body are supposed to be less elastic, is taken up with the repetition of old lessons or tasks already learned. Those who go up for their degree with the object of obtaining official position (for this seems the object of all learning in China, and rare it is to find knowledge pursued for her own sake), doubtless work hard, and are, after their own ideas, entitled to be called the educated classes. The Chinese boys, although their curriculum embraces only the ancient classics, have longer hours, less pleasant tasks, fewer holidays (no Sundays or half Saturdays), than European boys. Their holidays consist of one month in summer and one month at the New Year. Their school books are not illustrated, and their tasks are not graduated like ours to the youthful mind. The three-character classic, a philosophical treatise in rhyme, which is the primer in all schools, begins with such a sentiment as this :—" At the birth of man his nature is radically good " (*jen chi chu, hsing pen shan*). Underfeeding seems to be at the bottom of a great deal of the so-called over-pressure in schools in England at the present day. The practice of dividing the week by making Thursday, as in some parts of the continent, the school holiday, would give a salutary check to the tension of school life, which extends at present unbroken for six days.

Pastimes.

The Chinese pastimes, beyond tea drinking, tobacco smoking, fan plying, doing nothing, writing characters, composing verses, &c., consist in bird-airing and training, kite-flying (and there is no country in the world to beat China for grandeur and beauty of kites. Kites seem to have originated in China, the emblem being the dragon and the animal frequently depicted on their kites, and whose supposed form they frequently assume: hence perhaps the German drachen and the Scotch dragon), stone catching, battledore and shuttlecock, exercises of the bow and arrow, &c. These last are a part of the military exercises necessary to entitle the Manchus to their monthly allowance from the Imperial exchequer. Archery was one of the departments in the old Chinese University system. The Bannermen at Peking learn to draw the bow and aim the arrow at a narrow perpendicular strip of cotton cloth stretched between two poles, and having a red circle or bull's-eye in the centre. This is to represent a soldier. The same exercises are employed by the cavalry, a long trench being dug, and while the horse gallops, the rider, with the reins thrown on the horse's neck, attempts to hit the mark. The introduction of foreign military arms will prove prejudicial to these primitive weapons. For an excellent description of the bows and arrows, *vide* p. 78 of the illustrated catalogue. The champion of the military athletic exercises last year at Peking dislocated his right shoulder on the day previous to the final examination. He applied at the hospital where he had the dislocation reduced, and proposed the following day to join in the games! In the pastimes mentioned above, adults for the most part find occupation. It looks strange to Europeans at first to see grown-up men flying kites; and were Chinese kites the common-place things they are in Europe, the practices might well be considered childish. Among Chinese pastimes we do not find any of the sports common in England. Such violent exercise would be considered unbecoming.

Even dancing seems to the Chinese an unnecessary and laborious task. If the Chinese were fond of dancing, they would pay others to do this for them.

Chinese women amuse themselves with fancy work, in which they have justly attained a world-wide celebrity; they also paint pictures, practise a little music, and sometimes write verse. Take the following fan song, translated by Dr. Martin, President of the T'ung wen College, Peking, as a specimen of their poetical powers :—

"Of fresh new silk all snowy white,
And round as harvest moon,
A pledge of purity and love,
A small but welcome boon.

"While summer lasts, borne in the hand,
Or folded on the breast,
'Twill gently soothe thy burning brow
And charm thee to thy rest.

"But ah! when autumn frosts descend
And autumn winds blow cold,
No longer sought, no longer loved,
'Twill lie in dust and mould.

"This silken fan then deign accept,
Sad emblem of my lot,
Caressed and cherished for an hour,
Then speedily forgot."

THEATRES.

The chief pastime and amusement of the people is in theatrical representation. Jugglery, ventriloquism, Punch-and-Judy shows, story-tellers, and such like, are everywhere to be found on the streets; but the better and official classes, who unfortunately have too much leisure on their hands, resort especially to the theatres, which are to be found usually outside the cities. Playactors and beggars do not enter into the Chinese body politic, and are excluded from the list of the *sz*, *nung*, *kung*, *shang* (scholars, agriculturists, handicraftsmen, and merchants). In spite, however, of the low value placed upon this class, theatres

and dining restaurants are the only two public places of amusement that are recognised and most frequented. The want of light, and their situation outside of the cities, and the early hours of the people, compel these representations to be held during the day. They are continued during the whole day, the principal plays being acted in the afternoons. Several pieces are acted in succession. Female characters are impersonated by men. It would be against all reason for women to appear on a public stage. The theatres are also restaurants, in which eating, smoking, tea-drinking, and conversation may be freely indulged. Each party hires a table for itself and friends, and occupies it the whole day. Silence is only observed when something interesting is being played. The actors paint. There are no lights, of course ; this is a great saving of expense, and gives entire immunity from fires and loss of life, which play such a conspicuous and sad part so often in our Western theatres. There is hardly a theatre in our land that has not been burned down once or twice, and hardly a year that does not chronicle some grave loss of life and property. Chinese poor people, and workmen generally, can very rarely visit these places. During national periods of mourning they are closed. In regard even to theatres, if health be a matter of any moment, the British stage may learn some useful lessons from Celestial representations. Our hours of commencing and closing are far too late. The theatres in Germany are closing just about the time when our fashionable society is going to the theatre, thus permitting of return home at a reasonable hour, without disturbing one's night's rest and repose, and occupations for next day. In England we seem to live as if our bodies were either valueless or immortal, and as if it were no concern of ours to husband our strength or nourish our powers, and so enjoy a long and healthy life. Our late dining habits are of course responsible to a large extent for our late theatrical hours. In Germany the theatre is an instrument of culture in music, poetry, &c., for the people, and thither single ladies can resort without exciting remark or exposing

themselves to criticism. With us it is too often a painful and powerful instrument of demoralization. Why should drinking saloons, &c., exist within the precincts of theatres, and abound in their neighbourhood? Why should so much evil gather around them? The latter begin to fill as the former begin to empty. What a revolution for good a change of an hour or two would accomplish, and still more if the theatres were open only during the day! Well-to-do people, who have plenty of leisure, could then visit these places with comfort, and they might become great educational institutions for the advancement of the national culture. They might be opened on Saturday exclusively for working men, at an hour in the afternoon to suit them.

I feel sure that this one change alone would make a very decided improvement in our mortality, police and drink bills, and in our large towns do more than anything else to elevate the people. We need earlier hours, a stricter censorship in matters of dress and morals, and more righteous surveillance of these hotbeds of moral disease which infect our large cities, and cluster around our theatres, music saloons, public-houses, &c. Theatrical representations in China in the country are similar to those in the city. There are strolling actors who traverse the country, appearing at certain places at particular seasons, when the whole country side repairs to some central village where a handsome theatre has been erected by subscriptions of the neighbouring villages, and having a large enclosed open space where the people congregate. The playing is on a stage at one end of such an enclosure.

The Chinese stage resembles very much what the English stage must have been in the time of Shakespeare. There is no curtain, scenery, or proscenium. The entrances and exits are from the back of the stage. Plays for the most part are historical. It is through the street story-tellers that the common people acquire their knowledge of the history and literature of their country. The plays are mere outlines, the dialogue being left to the spontaneous improvisation of the actors. The absence of women on the

stage is owing to the sense of propriety, and not, as has been suggested, from sufficient lack of intelligence on their part. Of the orchestral accompaniment, the less said the better, the element of noise entering largely perhaps into the music as into almost every other enjoyment and amusement. The profession of the stage occupies the lowest place in the social scale, and the actor and his family are proscribed from holding any position under Government. It is rather curious to see how such a profession is despised, and yet to find the theatre so much frequented. The emperor and high officials have private theatrical entertainments.

Early Hours.

This brings us to another subject, closely related to the preceding, and which has also an important bearing on health, viz., the early hours of the Chinese. "Early to bed, early to rise," is emphatically the rule which obtains in China. In summer and winter the country people and work people in towns, merchants and others, are at the markets, places of business, shops, schools, &c., by daylight. They retire shortly after sunset. It is rare to find people in the streets of a Chinese town after seven or eight o'clock. They are deserted, usually, much earlier in winter. The streets have no attractions, no gas, shops all closed, so that indoors is the only possible place for passing the evening. There are no evening dinner parties or social assemblies, musical concerts, &c. These all take place during the day. Our civilization and intellectual, commercial, religious, social, and philosophical activity has lengthened our hours of work, dislocated our times for meals, leisure and amusements, and created, if not new diseases, at least trains of grave symptoms, and rendered disease less amenable to treatment. Could not more be done in the West in the direction of earlier hours?

Repose.

Repose of body and mind is another of the important factors of Chinese health. Our national poet says, "Our foster nurse of nature is repose." There is repose of body. Walking is slow, measured, and dignified. Work is slow and steady. Periods of rest are frequent and highly valued. Nothing is done in a hurry. Period of convalescence is made long so as to guarantee the thorough resuscitation of the powers of the body. Nourishing the body (*yang shen*) is the object aimed at by all in health and in sickness. There is also mental repose. There are no religious, political, social, or philosophical meetings, discussions, newspapers, journals, and magazines. The Chinese have Confucius and Mencius, let them consult these sages, the Chinese scholar would say, who have taught all that is necessary for man to know of himself, and to guide him in his relations to the family, community, and state. Having all they need, what can Western learning teach them? Why strive after what, even if attainable, can be of no value?

Family Relations.

The only other point to which we shall briefly refer, is the effect of the *family relations* upon health. This subject is very closely connected with dwellings in China. The house is the one home of parents, sons, sons' wives and their children, and also of the daughters till marriage. Marriage in the case of the son is a *perfecting* or *completing* of his home (*chêng chia*); to the daughter it is a *going out of the door* (*ch'u men*), a leaving of her parents' house to enter that of her parents-in-law. Our adage therefore is reversed, of a son being a son till he marries a wife, and a daughter a daughter all the days of her life. The Chinese might run thus: A son is a son all the days of his life, but a daughter is a daughter till she becomes a wife. The patriarchal system rules in China. The father is the head of the house, and life and death are to a large extent in his hands. Parents are highly respected, nay, rever-

enced while alive and worshipped after death. Ancestral worship seems to be the national religion of China. There are fewer disputes and quarrels between mothers-in-law and daughters-in-law than might be expected from the proverbial difficulty of getting on with the former in the West. There is of course some friction, but the son is bound to take his mother's side. The theory is that another wife can be got, but not another mother. Hence suicide by opium, gold leaf, strangling, starvation, drowning in wells, are by no means uncommon. Marriage is invariably early, and, excepting some Roman Catholic sisters, it may be said all the Chinese are married. There are practically no old maids or old bachelors in China. These marriages are arranged and contracted for independently of the couple to be married, by the parents or go-betweens, a class of females called *mei jen* that exist everywhere. These marriages are frequently much too early—often in mere childhood, and the betrothal sometimes before birth. The future daughter-in-law is often, especially among the poorer people, brought to the house as a girl and lives there, assisting her future mother-in-law till her marriage. In Europe marriages are much too late. It is better to err on the Chinese side. Before, however, the Chinese early and universal marriage system could be adopted in the West, many radical changes would require to be inaugurated in our mode of life. As already remarked, the patriarchal system rules in China. The sons with their wives and families all remain under the parental roof. All income goes into the common good, and all expenses are defrayed out of the general purse. There is everywhere the natural and best instincts of human nature, in the desire for posterity. (Infanticide of female children exists in several provinces, but to a much less extent than is generally supposed, and poverty, expense of bringing up, and the final departure from the family, seem to have loosened the maternal ties, and driven many of the poorest classes to sacrifice certain of their female children where this sex may happen to predominate. Some Western nations, where

practices quite as revolting to human nature occur, should not be the first to throw stones at the poor Chinese.) The expense of living, housekeeping, servants' wages, the demands of fashion, &c., render it impossible for a young man in Europe beginning life to marry. He must wait for years—some of the best years of his life—till he has amassed sufficient money. In the meantime his life may have been such as to prove detrimental to himself and the manhood of the nation. Parents send their sons adrift in the world to make their own way and fortunes. Many succeed, many make shipwreck. In too many cases it ends in driving the sons to the four quarters of the globe in search of wealth; it breaks up the family ties and loosens all the bonds of affection, morality and religion. More especially is this the case in heathen lands. Finally the father dies, immensely wealthy, and rightly leaves his money to his children, for many of whom it comes too late to rescue from a vicious and libertine life, and who, if they do not die abroad, return home invalids. The tropical climate is charged with much of this mortality. An Irish physician is said to have once forcibly put it: "Foreigners come to the East, eat and drink, drink and eat, then die, and afterwards write home that the climate killed them." How all this would be averted if the father would make up his mind either to divide his living with his sons while he is alive, and as early in life as possible, or take them into family partnership, let them engage in his business or that of others, let them marry early and continue to live under the parental roof, or if they must go abroad, let them either go married, or marry shortly after settling. Let them be engaged early and before leaving home, and let them ask their parents' advice in such a momentous step. It would cost the father comparatively little to take charge of his sons and their wives and families until the latter were able to earn sufficient for their own maintenance. Some such modifications of our habits, modelled after the Chinese plan, is worthy of our consideration. It would increase the joys of life, provided life were confined, as it

ought to be, to simple pleasures, temperate habits, modest, becoming apparel, and neat and comfortable dwellings. The thought of dying worth thousands can afford no such pleasure as this. The only real use of great riches, according to Bacon, is in their distribution, the rest is but conceit. How many mothers' hearts would be comforted in seeing their sons and daughters growing up around them like cornered stones, polished after the similitude of a temple! The Chinese method would necessitate a re-arrangement of our houses, but greater health, economy, and happiness would be secured.

The Land Question and Peasant Proprietorship.

The land in China is split up, as in India, into so many millions of farms of a few acres. The manure of the cattle is used as fuel and not as a manure for the soil. Every family may be said to possess its own land, which gives it its birth and last resting-place. The country is studded everywhere with little villages whither the agriculturists congregate. The people are very poor, and just manage to live in the plainest and simplest manner. The great majority never taste animal food, but confine themselves to millet or rice and a little salted vegetable. In the case of drought in the north or inundations, for the periodic rain is often very uncertain in amount, the common people are reduced to beggary, living upon roots, bark, and leaves of trees, &c. At such times cannibalism is not unknown. The land has no dykes or hedges; stones are set up to mark the boundaries of each parcel, and it is a serious offence to meddle with these boundary stones. On account of the minute divisions of the land and the necessity of growing cereal and pulse in every family, the strength of the land is taxed to its utmost; the face of the country assumes the loveliest mosaic—patches of yellow, green, red, white, black and purple alternating in narrow strips. The women often work in the field as well as the men, and I have seen the husband holding the plough and

the wife and a donkey or a cow drawing it. The vast human machine in China is made of flesh and blood, and there it is cheaper in its working than that of steam and iron. Men and cattle are the locomotives and machinery of the East, and labour being both plentiful and cheap, it is extremely difficult for foreign machinery to compete with bone and muscle fed on a little millet or rice with some peas, beans and vegetables. Industry, skill, patience and the thoroughness of their garden-like cultivation make them what they are, and enable them to exist.

Up to a certain extent economically the land, we are told, might be divided among a larger number of proprietors, politically and socially it might also be better to have a still larger division of land, although the produce were even less than now; but assuredly, on economic grounds, *with our present mode of life*, if the land were held by a vastly increased number of people, it would lead to greater poverty than now exists. Industrial labour will always be paid higher than agricultural wages. In our country at present, with all its industrial enterprises, the prospects of opportunities of industrial employment are much greater than are the prospects of small farmers under the best agrarian system ever devised.

It is to be deplored that our industries and mode of life have condemned the people in the country, who were formerly prosperous and contented, to leave their homes and seek the large towns. When the markets of the world are glutted; when there are no more worlds to be conquered by our Alexanders of commerce, no more new countries to be opened up, and every country supplying its own wants, what is our old country, that has so largely abandoned agriculture and adopted industries, to do? A country cannot always live on manufactures, because the earth is not illimitable, and the nations we now supply will not always be content to import goods which their own people have learned to make. Competition, too, in trade is keen, and enterprise is constantly seeking to introduce into less civilised countries, not only manufactured goods,

but machinery of all sorts, which by-and-by will render the import of such goods unnecessary. We cannot touch upon the vexed question of free and fair trade and protection. These terms will in the future lose much of their significance. We should have less perhaps to say for the first if we had not been, and still are to a large extent, the first manufacturing country of the world. We work up into their final shape the unfinished products of other nations. It is therefore very easy for us to be free traders when the advantages are all on our side. Our pushing continental neighbours, taking advantage of this, find themselves free to introduce their goods into our country, proving prejudicial to our products, while our products are debarred from competing on equal terms in the foreign market. Nay, it would appear as if railway facilities were extended to foreign produce which are denied to home productions. The proposed raising of railway rates for the transport of home agricultural produce is surely a mistake. We have insisted that manufactures must grow, and we believe there is no end to the foreign markets to be supplied by our goods. Even in regard to opening up and possessing unexplored markets, competition and national jealousy are keen. But, admitting the failure or want of expansion of foreign trade, we must never forget that the home trade might be made almost inexhaustible; our agriculturists would become the purchasers; much of the enormous sums spent on mere luxury and drink would be spent on necessary articles; small farms, growing food for simpler tastes, would multiply, and less grain and meat from abroad would be needed. If we are to be really prosperous, imported food must not bulk so largely; we must live considerably more on home-grown provisions. Think of 85 per cent. of all the grain raised in the United States grown by the hands of those who own the soil. Think of the £5,000,000 we send across the channel yearly to our French and other continental neighbours for eggs, poultry, fruit and vegetables, all of which should be produced by ourselves, while common lands are untilled and our labourers idle and half-starved.

Small proprietorships in the matter of growing wheat or grazing cattle cannot succeed. The supply of grain from abroad does not fall off. There is increased production in the United States, Russia, and India. The increase in one year in the former country is greater, we are told, than the whole area of our wheat crop. The price of cattle is just as unsatisfactory to the feeders as that of grain. Our supplies of meat from the Australian colonies can be almost indefinitely increased. What remains to us, therefore, in our little island home, it would seem, is largely to adopt market gardening, as in the Channel Islands. That which gives the largest profit will of course always be adopted, and if our mode of life were fortunately to be changed on Chinese lines, we should find ample opening for all our spare labour and the utilization of our waste lands and the rich supply of cheap and nourishing provisions.

The system of small holdings has been tried in some places and succeeded; in others it has been so far a failure. It is a highly desirable condition that our agricultural labourers should possess a piece of grass land of a few acres adjoining their dwelling houses, on which to keep a cow and other farm stock. Each tenant should have some other occupation. There should be sufficient land for the labourer and his family to cultivate without interfering with his wage. The success of small holdings seems to lie here. Artisans and mechanics should not be taken from the town and put into farms, unless indeed they came from farms and wished to return. The idea is to attract people to stay in the country. The system of large farms, like large nations, is modern, and its tendency is towards depopulation of the country. By increasing the number of tenant farmers, greater prosperity for the country and increased happiness for the people will be found. It must not, however, be forgotten that peasant proprietorship in China in the country co-exists with masses of poor in the cities. On the other hand we are told of hardy, hard-working and industrious people in Italy, where the land in some parts is divided among so many proprietors, becoming

so poor as to be obliged to sell and emigrate. The depreciated value of the land, it is said, is barely sufficient to pay the local and State taxes, notwithstanding the people being in that condition which has been supposed by some as the panacea in the regeneration of the human race. Peasant proprietorship is there lamented as a national misfortune, according to a late correspondent in the *Times*.

Peasant proprietorship, so much advocated and supposed to be the universal panacea for all the ills that afflict humanity, as things are at present in our country, is neither possible nor desirable. Landed proprietors, great and small, find themselves unable to compete in the market with either the grain imported from foreign countries in such enormous quantities, or the flesh meat also so largely imported, and likely to increase. It is obvious the solution of our present difficulties does not lie in the possession of more or fewer acres, but in a radical change in our habits of life, and especially in a simpler though not less nourishing diet. Such a change would make peasant proprietorship both possible and desirable, and would indeed produce a revolution in our mode of life ; everything would be cheapened, and comfortable and healthy, life would be within the reach of all. By the production of all the various kinds of vegetables, legumes, fruits, the rearing of poultry and pigs, the preparation of fruit preserves, and preserved fruit, the cultivation of bees, the fishing of our seas and rivers, a healthier and happier state of things would be inaugurated. The masses of our people would not then require to flock into and overcrowd the cities ; the country would be able more effectually to supply its own wants, and we should be much less dependent upon the imports from foreign markets. With such a life, agriculture would come to occupy its true place in the prosperity and well-being of the country (for without agriculture no country can be permanently great or lasting), and our population, with peace and plenty reigning everywhere, might be quadrupled, and we should even then not be cut short of the necessaries of life ; our operatives would not then be so

subject to commercial depressions, and if they did come, would be better able to meet them, either in reduced expense, or their easy transference to garden pursuits. The health and longevity of the people would be increased, and strong drink would cease to be the necessity which at present it seems to be to so many. In proportion as vegetable diet increases, the congestion of the towns will be relieved and depopulation of the country stayed, and there might even be a reflux from town to country. This, of course, is not a complete remedy for urban squalor, abject misery and poverty, but it seems to me that it would go a long way towards rectifying many of the glaring evils of our present civilization.

Concluding Remarks.

The bearing of the foregoing papers on food, clothes, and houses of the Chinese in relation to some of the problems loudly calling for solution at the present day, will be apparent to the reader. With the view of making the papers as interesting and instructive as possible to Western readers, and of adding to our stock of information on these little known Chinese subjects, we have added many particulars which cannot be said to have any strict bearing upon health, but which were suggested by its treatment. We have possibly looked at the subjects too much from a Chinese point of view. It will not surely be doubted that we have much to learn from the Chinese, more perhaps than we are prepared to believe. The condition of that Eastern people, their immunity from inflammatory and acute diseases of the various organs of the body, the absence of gout, rheumatic, and, I think I may also say, of typhoid, although unfortunately not of typhus fever, as will be readily understood, of the acute diseases of the respiratory organs, and, excepting small-pox (which is now being successfully attacked by vaccination), of the considerable diminution in the severity of other zymotic diseases, are sufficiently striking to cause us to ponder. In the West

we believe that a large proportion of disease is preventible, especially of the zymotic type, which we hope some day to exterminate altogether. The inflammatory, gouty, and rheumatic affections, and especially those of the respiratory organs, are, according to Chinese ideas, even more under our control. Nearly all our efforts at present seem to be directed against the infectious diseases. It is time we began a more serious crusade against the inflammatory, which are even more fatal and are constantly among us, although they do not strike us so vividly. They seem to be taken more as a matter of course, as part of the penalties attaching to life and climate, and against which it is vain to contend. We have tried to point out what we conceive to be some of the principal Chinese causes for this wonderful immunity. Owing to the importance of the subject, we have tried at the same time to show where the dangers, both open and lurking, of our system lie. We do not scruple to affirm our belief in the absolutely unattainable character of the sanitary and engineering objects aimed at by the present modes of work. We may mitigate many of the evils, we shall never succeed on our present lines in removing them. The whole of this all-important question, associated with individual and national weal, cannot reasonably be left in the hands of sanitary engineers, legislators, registrar-generals, nor even physicians, however praiseworthy all their efforts may be. The individual must also exercise reasonable prudence and foresight in regard to the laws of health. We cannot throw off individual responsibility and care. While admitting most fully the influences of climate and race, we think there is great room for recasting our ideas and hitherto recognised principles and practices in relation to the subjects here treated. It may then be found that we are not so much the victims of climatic and racial influences as we had supposed, and that in the course of a few generations we might be able to change the whole aspect of disease and type.

In conclusion, I have to apologise for the great length to which these desultory and disjointed remarks have

extended, altogether far beyond their inherent worth or interest. My sole object has been to give a plain and unvarnished picture of the food, clothing, and houses of the Chinese, and, by contrasting them with our own, to suggest possible improvements in the latter. There is no necessity for tabulating the differences we have tried to point out, or for bringing them, as it were, to a focus. A long residence in the East has necessarily prevented me from becoming intimately acquainted with the measures of reform already in operation here, and also with many of the existing defects and evils. To very many the ideas and suggestions thrown out must appear crude, perhaps Utopian. They are presented from a European point of view, aided by a lengthened abode among the Chinese and some little acquaintance with their customs, manners, and habits of thought and life. The papers have been written during a short furlough in Switzerland, without access to my own or any other library. No one therefore knows their imperfection better than the writer, but he prays for the indulgence of the reader, and hopes by the publicity which they will receive, arising out of their mode of publication, and to which their intrinsic value could not otherwise lay claim, that they may be instrumental in calling attention to some perhaps-too-little-considered phases of the great food, dress, and house reform question, with the result that our people may advance still further in material prosperity, coupled with a vastly greater freedom from disease and a much greater amount of happiness and health, and also that they may contribute in some small and humble measure to convince our people that powerful agencies lie in their own hands for the amelioration of their condition and eradication of many of the blots of our present civilization. I fear many after perusing these pages will exclaim, Is life then worth having on such Chinese terms? "Better fifty years of Europe than a cycle of Cathay."

HEALTH MOTTOES.

"Appetite grows by what it feeds on."

"Sleep, aery light, from pure digestion bred."

"Man wants but little here below,
Nor wants that little long."

"Feed me with food convenient for me."

"First secure food, then secure clothing."—(*Chinese proverb.*)

"Feed moderately on wholesome food—garden herbs surpass rich viands."—(*Chinese proverb.*)

"In dress and food do not break rules."—(*Chinese proverb.*)

"Do not covet for the mouth and belly, and so slay beasts and birds without restraint."—(*Chinese proverb.*)

"The more you eat, the less the flavour; the less you eat, the more flavour."—(*Chinese proverb.*)

"Clothes can't be made an inch too long,
Boots must not be a fraction wrong."—(*Chinese proverb.*)

"The goodness of a house does not consist in its lofty halls, but in its excluding the weather; the fitness of clothes does not consist in their costliness, but in their make and warmth; the use of food does not consist in its variety, but in its satisfying the appetite; and the excellence of a wife consists not in her beauty, but in her virtue."—(*Chinese proverb.*)

"And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat."

"The first wealth is health."

"Our basest beggars
Are in the poorest thing superfluous."

"The stomach listens to no precepts; it begs and clamours for food, yet it is not an obdurate creditor. It is dismissed with a small payment if only you give it what you *owe*, and not as much as you *can*."
—*Seneca.*

"The true ornament of matrons is virtue, not dress."—*Justin.*

"In the matter of dress, one should always keep below one's ability."—*Montesquieu.*

"The nakedness of the indigent world may be clothed from the trimmings of the vain."—*Vicar of Wakefield.*

"Frugal by habit, they scarcely knew that temperance was a virtue."—*Vicar of Wakefield.*

> "The gods are just, and of our pleasant vices
> Make instruments to scourge us."
>
> *King Lear*, act v., scene iii.

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